

teccaTM

Teca pioneered the market of solid-state air conditioners for electronic enclosures. Products are available for harsh environments such as NEMA-4X as well as explosive (Class 1 Division 2) locations. We offer a full line of cooling products, from liquid cooled air conditioners, to cold plates and liquid chillers.

We have met the needs of the Original Equipment Market by offering complete engineering services, prototype development and custom built cooling equipment through an exclusive and confidential basis.

Since the cooling is based on solid-state technology, moving components that clog or wear out are not required. All products we build are environmentally safe, unlike conventional refrigeration methods which employ CFC's (chloroflourocarbons), corrosive liquids and gases.

Whatever your application—we can fulfill all of your cooling requirements. Our engineers may have already developed a similar solution. We are available to work with you to discuss your specifications. Together we will design and build a quality system that sets the standard in thermoelectric cooling. Call us at (773) 342-4900. We'll take it from there!



Continuous in-line and final quality assurance inspections are implemented. This insures that all components, throughout the assembly process, provide 100% compliance for trouble free operation.

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Model Number Code

A	H	P	-	1	2	0	0	X	M	H	C
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SERIES	MODEL	TYPE
AHP	Refer to table of contents	CP Cold Plate
FHP		FF Air Conditioner, cold side fins & fans
LHP		X Nema-4X
ALC		XM Nema-4X + Shock & Vibration
TLC		XP Nema-4X + Explosion Proof
		HC Heating + Cooling

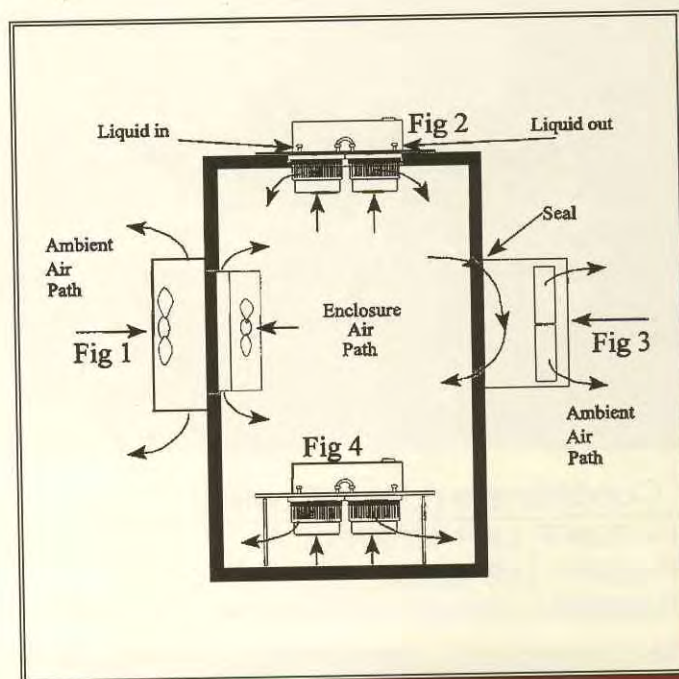
Mounting Styles*

* Since there are no fluorocarbons, units can mount in any orientation.

Figure 1	AHP-	Thru Mount
Figure 2	LHP-	Thru Mount
Figure 3	FHP-	Flush Mount
Figure 4	LHP-	Internal Mount (LHP series is adaptable to explosion proof applications)

Moisture Removal:

All FHP-Series and AHP-1400 air conditioners contain a built-in condensate removal system. TECA also offers drip pans on other models for enclosures containing high humidity or incomplete cabinet seals.



DESIGN ENVIRONMENTS: (NEMA, Mil-Std, NEC, UL/CSA)

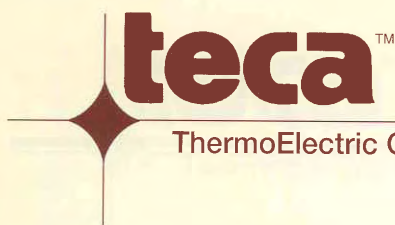
NEMA Type

Source: NEMA Publication No. 250, Part 1, Page 1

- Nema-12** Type 12 enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.
- Nema-4X** Type 4X enclosures are intended for indoor and outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water.

TECA Products carrying the Nema-4X designation use Mil-Spec fans, o-ring sealed power supplies, no exposed electronic components, stud/gasketed mounting, and Mil-Spec finishes on exterior. They are designed to maintain enclosure rating and perform in the rated environment.

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Military Standards

Mil-Std 810	Corrosion:	(Salt Fog Testing) Method 509.2, 168 Hours, <i>Employed for all Nema-4X units</i>
	Vibration:	Method 514.3, 2 hours, x,y,z axis 8.9 G's, 10-2000 Hz with a magnitude of 0.04 G ² /Hz, <i>Employed for all XM- Versions, Standard models are designed to withstand 2.2 G's.</i>
	Shock:	Method 516.2, with 30 G's peak amplitude, 11ms pulse duration, half-sine waveform, and three (3) shocks in each direction along three (3) mutually orthogonal axes, <i>Employed for all XM- Versions</i>

NEC

Source NEC 1993, Article 500, 70-466 to 70-471

CID2	Class 1, Division 2 (Hazardous Environments) A Class I, Division 2 location is a location (1) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or (2) in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment; or (3) that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.
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Groups (A-D)	Atmospheres containing the following: acetylene, hydrogen, fuel and combustible process gases containing more than 30% hydrogen by volume, or gases or vapors of equivalent hazard such as butadiene, ethylene oxide, propylene oxide, acrolein, ethyl ether, ethylene, or gases or vapors of equivalent hazard, acetone, ammonia, benzene, butane cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, naphtha, propane, or gases or vapors of equivalent hazard.
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Applies to models AHP- (1200XP, 1200XPHC, 1801XP, 1801XPHC)

UL/CSA Standards

UL-1604	Hazardous duty operation, Class I and II Division 2, Class III Div 1 and 2 Tested thru ETL and ETLc Testing Laboratories, Report # 532015
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Applies to models AHP- (1200XP, 1200XPHC, 1801XP, 1801XPHC)

UL-1995 CSA 22.2	Heating & Cooling Equipment, Categories 169 & 294, No. 236-M90 Tested thru ETL and ETLc Testing Laboratories, Report # 532015
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Applies to models AHP- (1200, 1201, 1200HC, 1201HC, 1200X, 1200XHC, 1801, 1801X, 1801XHC, 1801HC)

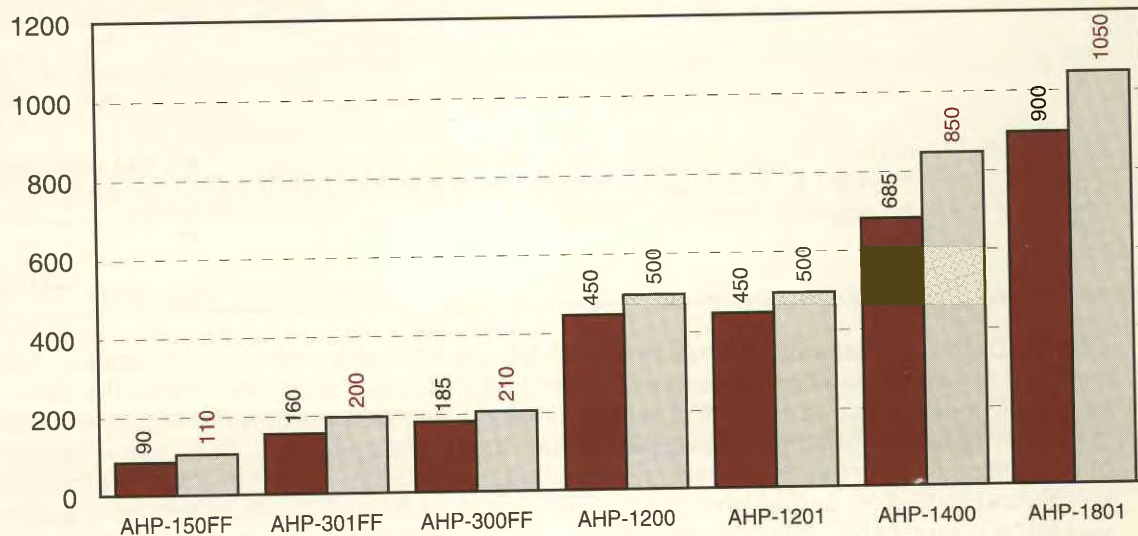
Reliability & Mean Time Between Failure (MTBF)

The life expectancy of a thermoelectric device is exceptionally high due to its solid state construction. Service life is typically in excess of five (5) years, under normal conditions.

For T.E. Modules, MTBF's on the order of 2-300,000 hours at room temperature, 100,000 hours at elevated ambients of 80°C, have been calculated.

Product Selection Chart

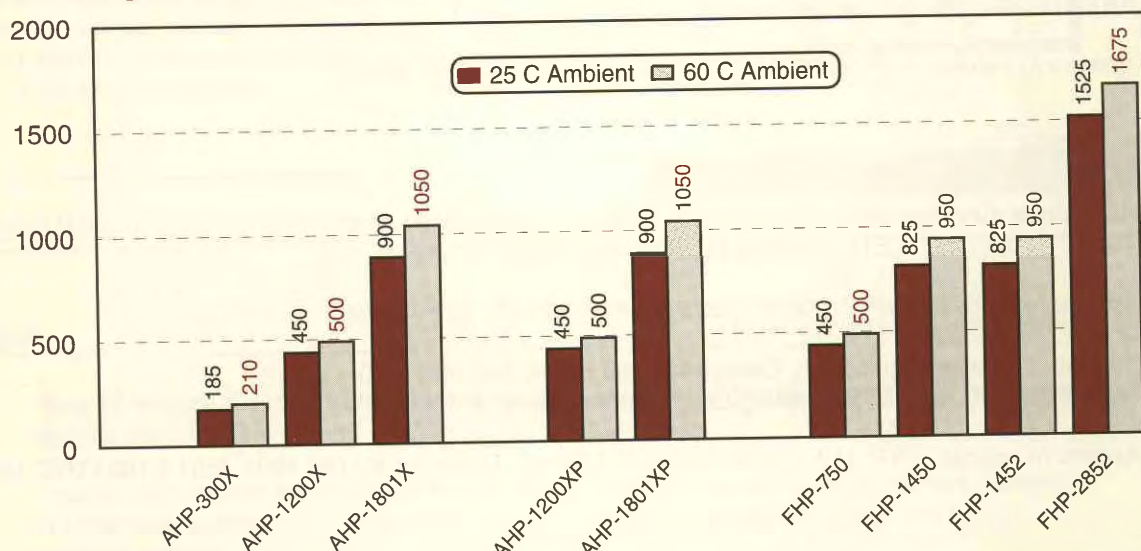
Cooling Capacity (Btu/h)



Nema-12
Thru Mount
AIR CONDITIONERS

■ 25 C Ambient ■ 60 C Ambient

Cooling Capacity (Btu/h)



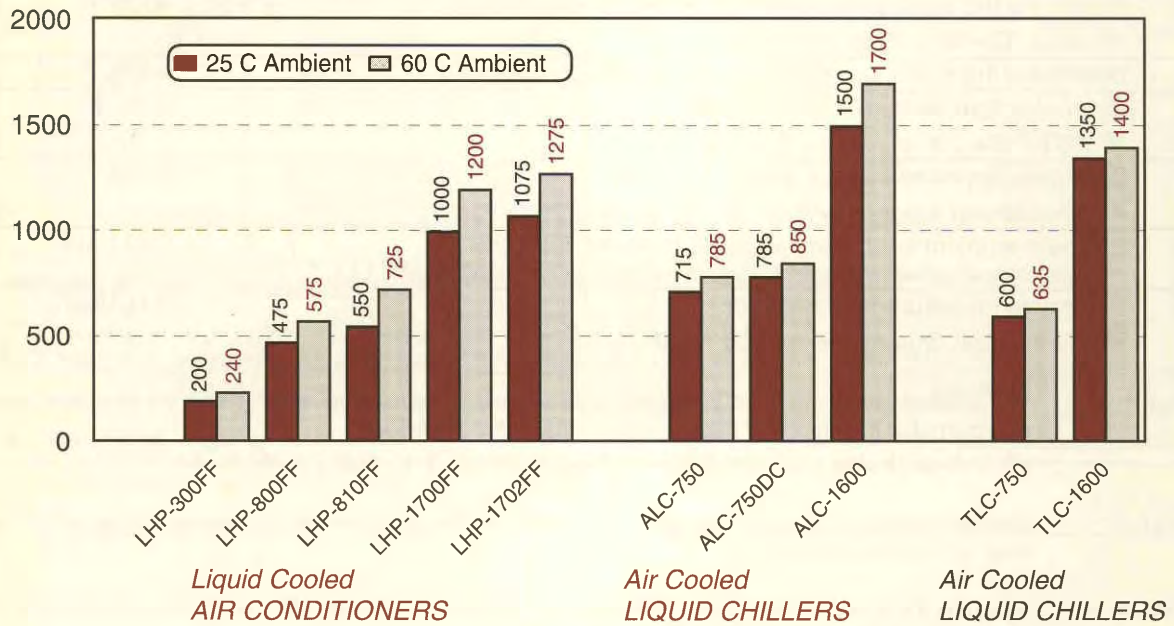
Nema-4X
Thru Mount
AIR CONDITIONERS

Explosion Proof
Class 1 Div 2
AIR CONDITIONERS

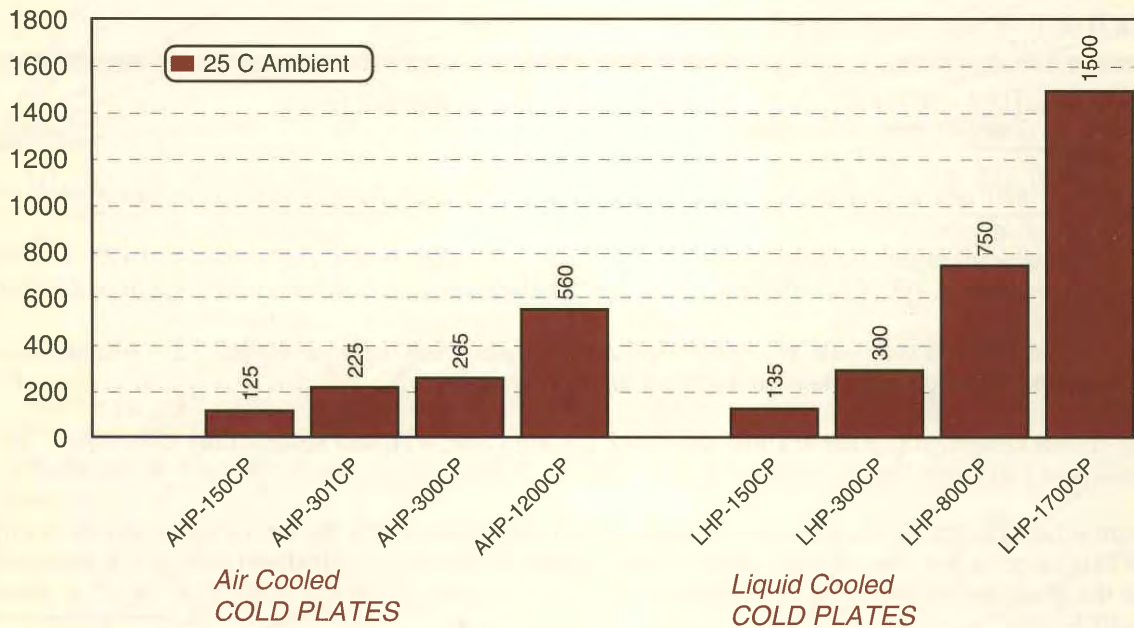
Nema-12
Flush Mount
AIR CONDITIONERS

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Cooling Capacity (Btu/h)



Cooling Capacity (Btu/h)



Air Conditioner Sizing:

To size an air conditioner proceed with the following 7 steps.
A free standing enclosure (3' x 3' x 2') with 1" insulation has been provided as an example.

STEP			English	Metric
#1:	(Ta)	Determine the maximum ambient (outside) air temperature <i>✎</i> $(9/5 \times ^\circ\text{C}) + 32 = ^\circ\text{F}$ or $5/9 (^\circ\text{F} - 32) = ^\circ\text{C}$	+120°F	+50°C
#2:	(Te)	Determine the maximum allowable enclosure air temperature	+100°F	+38°C
#3:	(ΔT)	Determine temperature differential (Step 2- Step 1) <i>✎</i> $9/5 \times \Delta^\circ\text{C} = \Delta^\circ\text{F}$ or $5/9 \times \Delta^\circ\text{F} = \Delta^\circ\text{C}$	- 20°F	- 12°C
#4:	(Sa)	Determine exposed surface area = $2(\text{H} \times \text{W}) + 2(\text{H} \times \text{D}) + 2(\text{W} \times \text{D})$ <i>✎</i> (Exclude non exposed surfaces, see fig. 2) $1\text{m}^2 = 10.76\text{ft}^2$, or $1\text{ft}^2 = .0929\text{m}^2$	42 ft ²	3.9 m ²
#5:	(Qa)	Estimate ambient load (Example uses 1" insulation, see fig. 3) (Positive if cooling below ambient, Negative if cooling above ambient)	140 Btu/h	41 watts
#6:	(Qe)	Determine enclosure internal load <i>✎</i> (Fill in actual, or use either method 1,2,3)	341 Btu/h	100 watts
<p>Method 1: For resistive loads, measure the electrical power into the enclosure and subtract the electrical power out. This approximates the electrical load generated inside the enclosure. <i>✎</i> Voltage (Volts) x Current (Amps) = Power (Watts), & {1 Watt = 3.414 Btu/h}</p> <p>Method 2: If power cannot be measured directly, check with the manufacturer of each device and add the load (Watts) from all internal components.</p> <p>Method 3: Measure the steady-state temperature rise from ambient to internal with the enclosure completely sealed. See fig. 3 on following page to estimate the internal load.</p>				
#7:	(Qt)	Total Load (Step 5 + Step 6) <i>✎</i> (Add additional loads at this time, i.e. solar or radiated loads)	481 Btu/h	141 watts

Using Performance Curves:(See fig. 1)

X- (Horizontal Axis)	Total Load Line	(Qt)	(Watts or Btu/h)
Y- (Vertical Axis)	Temperature Differential Line	(ΔT)	(°C or °F)

✎ (ΔT) from ambient to enclosure. Values are (-) for below ambient cooling and (+) for above ambient cooling.

There is usually a blue shaded region on each performance curve. The upper end is performance at +25°C/+77°F ambient. The lower end is performance at +60°C/+140°F ambient. The shaded region includes performance from 25°C to +60°C.

✎ Please Note: A thermoelectric cooler is typically more efficient at higher ambients, due to inherent properties in the material. This is the opposite of conventional fluorocarbon systems.

To use the performance curves, you need to know total load, (Qt from Step #7), and temperature differential, (ΔT from Step #3). From the example you know that the total load is 141 Watts. Draw a vertical line to intersect at this load.

Next, place a point within the shaded region and on the vertical line to approximate the actual performance at ambient of 50°C. Since 50°C is close to the lower border, place a point slightly above the border. Then extend a horizontal line thru the point to intersect the y-axis (or ΔT line). For our example, we are at roughly -13°CΔT or -23.4°FΔT, which is greater than the required -12°C/-20°F.

Result: ✓ Adequate cooling capacity with this model.

Line equations are also provided below each performance curve. You can solve for ΔT by substituting the load, or solve for load by substituting ΔT.

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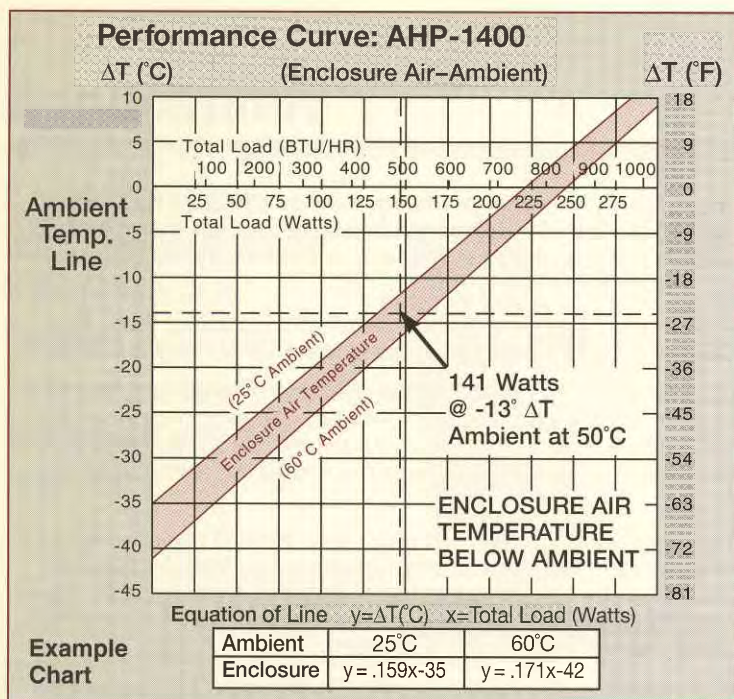


Figure 1

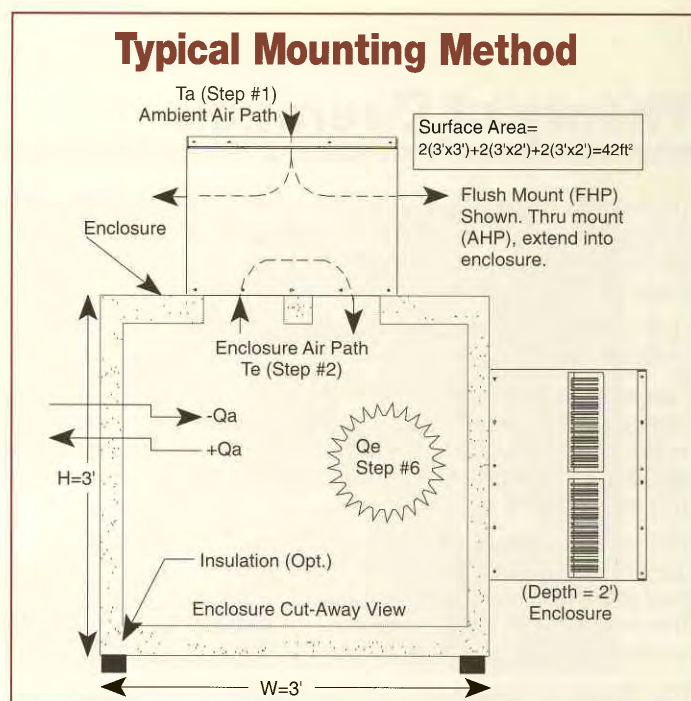


Figure 2

Ambient Load* (Q_a), From Step #5

* Calculated using steel enclosure, insulation R Value (1")=4

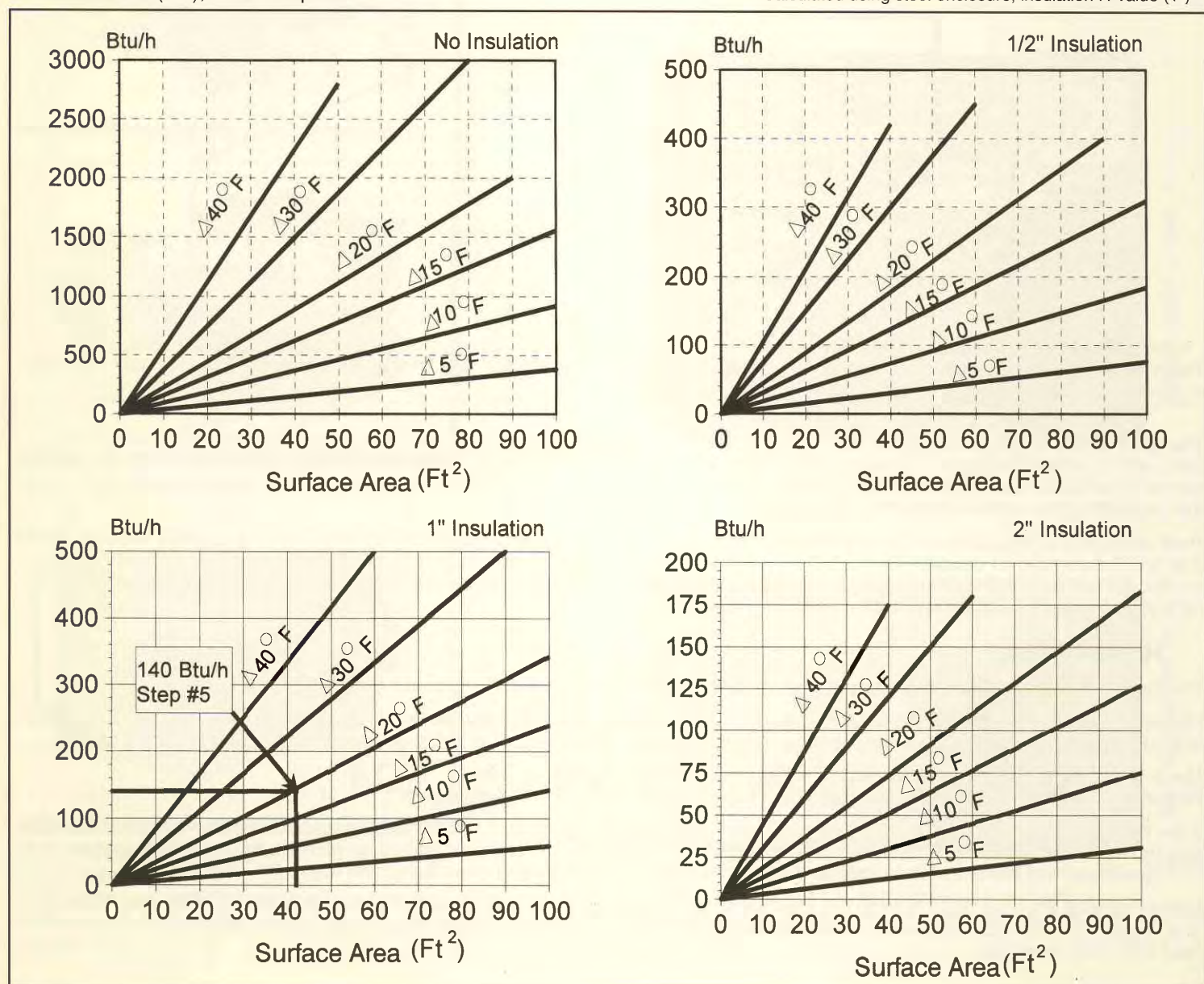


Figure 3

Theory of Operation

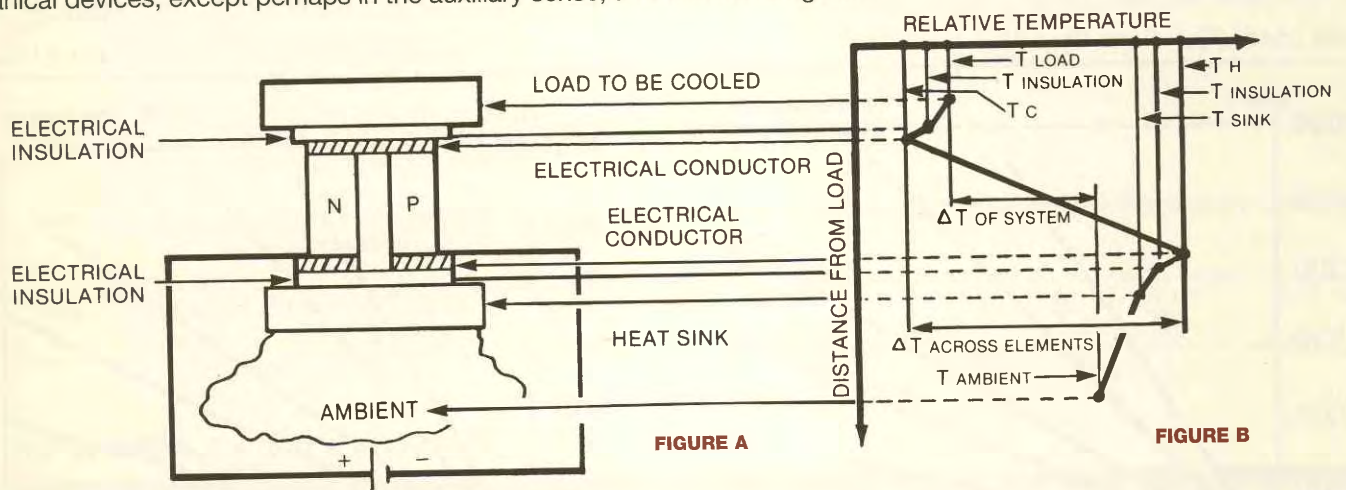
Thermoelectric cooling, or as it is sometimes called, "The Peltier Effect," is a phenomenon discovered by a French watchmaker during the early 19th century. It is described as a solid-state method of heat transfer generated primarily through the use of dissimilar semiconductor materials. To understand the cooling method, it is first necessary to know how thermoelectric cooling systems differ from their conventional refrigeration counterparts.

Like conventional refrigeration, thermoelectrics obey the basic laws of thermodynamics. Both in result and principle, then, thermoelectric cooling has much in common with conventional refrigeration methods - only the actual system for cooling is different.

Perhaps the best way to show the differences in the two refrigeration methods is to describe the systems themselves. In a conventional refrigeration system, the main working parts are the evaporator, condenser, and compressor. The evaporator surface is where the liquid refrigerant boils, changes to vapor and absorbs heat energy. The compressor circulates the refrigerant and applies enough pressure to increase the temperature above ambient level. The condenser helps discharge the absorbed heat into the ambient air.

In thermoelectric refrigeration, essentially nothing has changed. The refrigerant in both liquid and vapor form is replaced by two dissimilar conductors. The cold junction (evaporator surface) becomes cold through absorption of energy by the electrons as they pass from one semiconductor to another, instead of energy absorption by the refrigerant as it changes from liquid to vapor. The compressor is replaced by a DC power source which pumps the electrons from one semiconductor to another. A heat sink replaces the conventional condenser fins, discharging the accumulated heat energy from the system.

The difference between the two refrigeration methods, then, is that a thermoelectric cooling system refrigerates without use of mechanical devices, except perhaps in the auxiliary sense, and without refrigerant.



Thermoelectrics (Def): Semiconductor materials with dissimilar characteristics are connected electrically in series and thermally in parallel, so that two junctions are created (Figure A).

The semiconductor materials are N and P type, and are so named because either they have more electrons than necessary to complete a perfect molecular lattice structure (N-type) or not enough electrons to complete a lattice structure (P-type). The extra electrons in the N-type material and the holes left in the P-type material are called "carriers" and they are the agents that move the heat energy from the cold to the hot junction.

Heat absorbed at the cold junction is pumped to the hot junction at a rate proportional to carrier current passing through the circuit and the number of couples. Good thermoelectric semiconductor materials such as bismuth telluride greatly impede conventional heat conduction from hot to cold areas, yet provide an easy flow for the carriers. In addition, these materials have carriers with a capacity for carrying more heat.

Heat Sinks:

The design of the heat exchanger is a very important aspect of a good thermoelectric system.

Figure B illustrates the steady-state temperature profile across a typical thermoelectric device from the load side to the ambient. In figure B, the total steady-state heat which must be rejected by the heat sink to the ambient may be expressed as follows:

$$\text{Heat Rejected } (Q_s) = \text{Heat Absorbed From the Load } (Q_c) + \text{Power Input } (V \cdot I) + \text{Heat Leakage } (Q_1)$$

If the heat sink is not capable of rejecting the required Q_s from the given system, the temperature of the entire system will rise and the cold junction temperature will increase. If the thermoelectric current is increased to maintain the load temperature, the COP (coefficient of performance) tends to decrease. Thus, a good heat sink contributes to improved COP.

Energy may be transferred to or from the thermoelectric system by three basic modes: conduction, convection, and radiation. The values of Q_c and Q_1 may easily be estimated; their total along with the power input gives Q_s , the energy the hot-junction heat sink must dissipate.

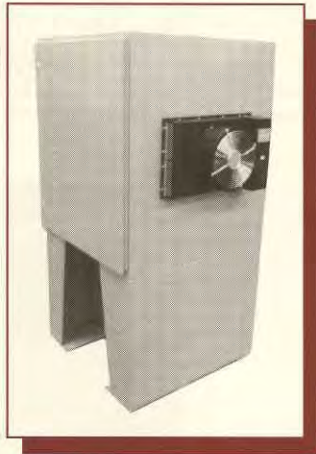
Applications

(773) 342-4900

There are many successful users of thermoelectric cooling systems.

Here are a few examples you may find helpful...

Cooled enclosure system for ADC Camera Power Supply.

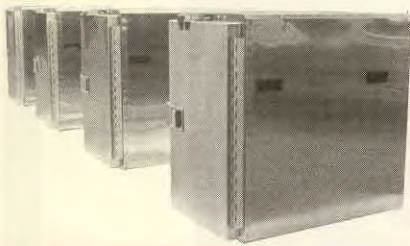


(Photo courtesy of N.A.S.A.-Langley Research Center)



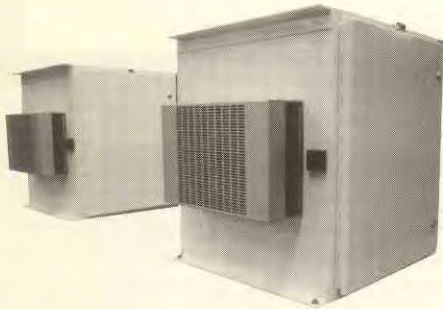
(Photo courtesy of New Zealand Dairy Research Institute)

One of the world's leading centers for dairy research uses thermoelectric cold plates with temperature control for tempering fat samples prior to pulsed NMR measurement of solid fat content.



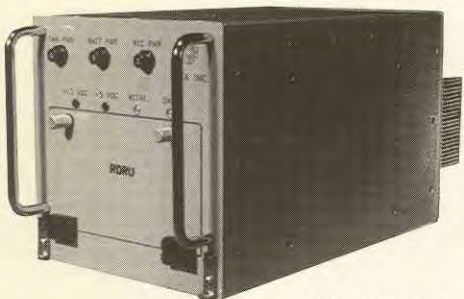
(Teca File Photo)

Food Service Refrigerators for Airborne Application



(Photo courtesy of Scientific Atlanta-Jet Propulsion Lab)

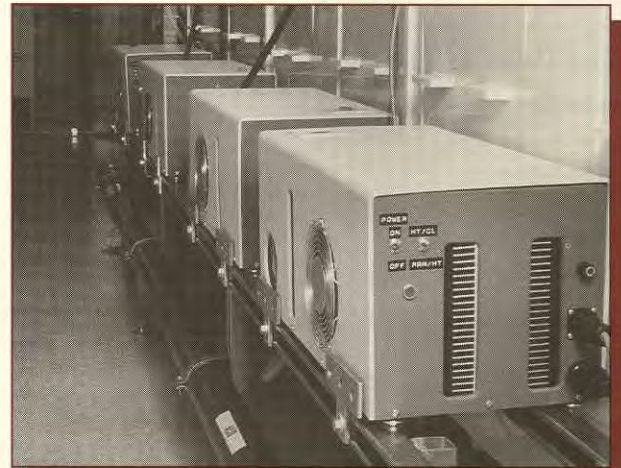
Cooled Enclosure System for Tower Mt. Horn/Electronics Assembly



R·D·R·U IV

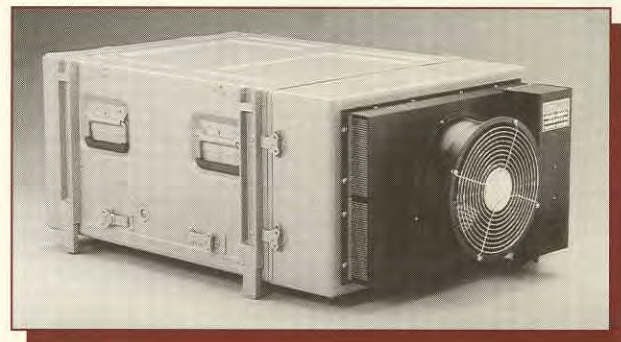
(Photo courtesy of Veda Incorporated)

R.D.R.U. (Ruggedized Digital Recording Unit), utilizes a thermoelectric heat/cool system for reconnaissance data collection, flight test & evaluation, and automotive test and instrumentation.



(Photo courtesy of Noah Precision)

A manufacturer in the semiconductor industry uses a solid state liquid chiller to precisely control fluid temperatures for water jacketed columns and etch baths.



(Photo courtesy of EDAK)

A manufacturing specialist of transport equipment uses a solid state cooling system to protect electronic equipment from harsh, high stress conditions.

Fin Rating 2200-2400 Btu/Hr
(Ambient to Cold Side Fin)

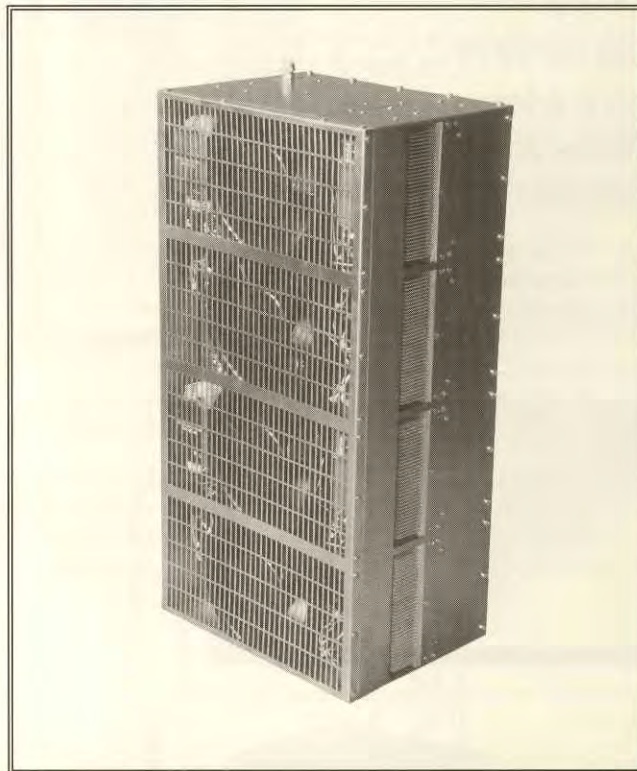
Air Rating 1500-1700 Btu/Hr
(Ambient to Cold Side Air)

Features:

- Flush (External) Mount
- Compact, only (24" L x 12" W x 9" D)
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Stainless Steel Exterior Housing
- Nema-12 Rating Maintained
- Mounts in any Orientation

Includes:

- Integral Power Supply (220 VAC Input)
- Condensate Removal System
- TC-6F Thermostat



Cools Equipment Racks, PC's, Drives, Amplifiers, Motor Controls, & Other Electronic Equipment

Teca's FHP-Series air conditioners are designed for tightly packaged enclosures. There is no intrusion within the enclosure, allowing for greater design flexibility. Model FHP-2852 packs a powerful punch. It is currently the highest standard capacity thermoelectric system on the market! Ideal for harsh Nema-12 environments such as steel and paper mills, foundries and food processing plants.

SPECIFICATIONS:

Model Number

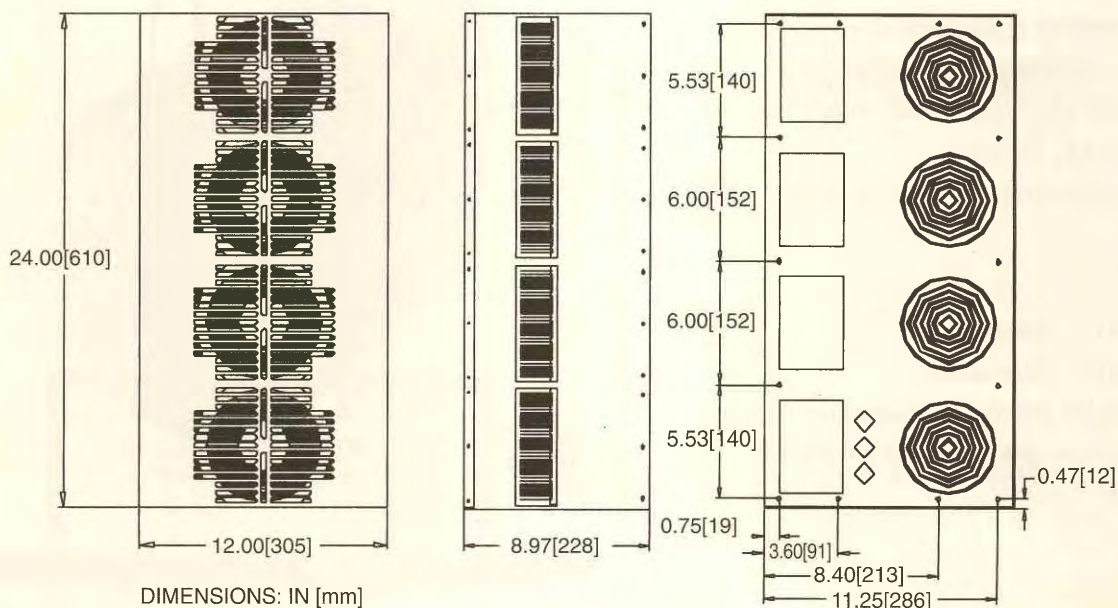
FHP-2852

- | | |
|-----------------------|------------------------|
| • Input Voltage | 230 VAC (115 VAC Opt.) |
| • Input Current | 11-12 Amps RMS |
| • Frequency | 50/60 Hz |
| • Minimum Ambient | -10°C / +14°F |
| • Maximum Ambient | +70°C / +158°F |
| • Enclosure Rating | Nema-12 |
| • Weight | 70 lbs. / 32 Kg. |
| • Temperature Control | TC-6F (Included) |

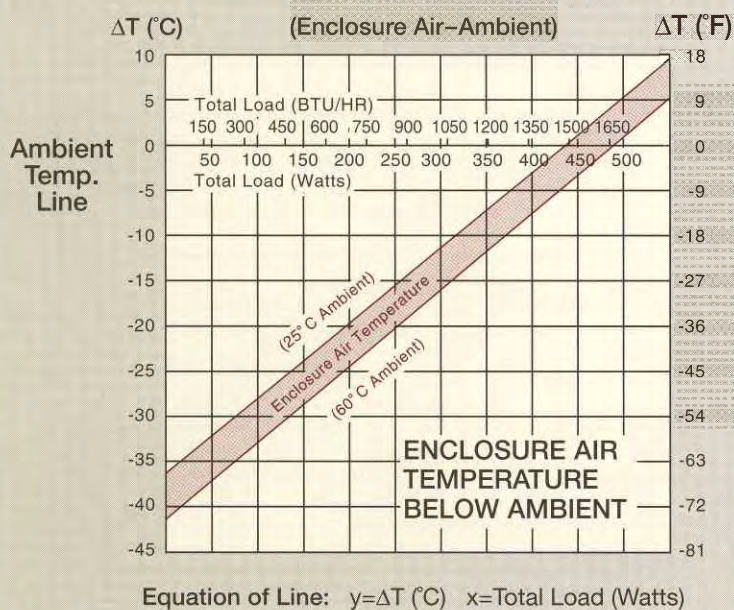


Toll Free (888) TECA USA (832-2872)

Dimensions:

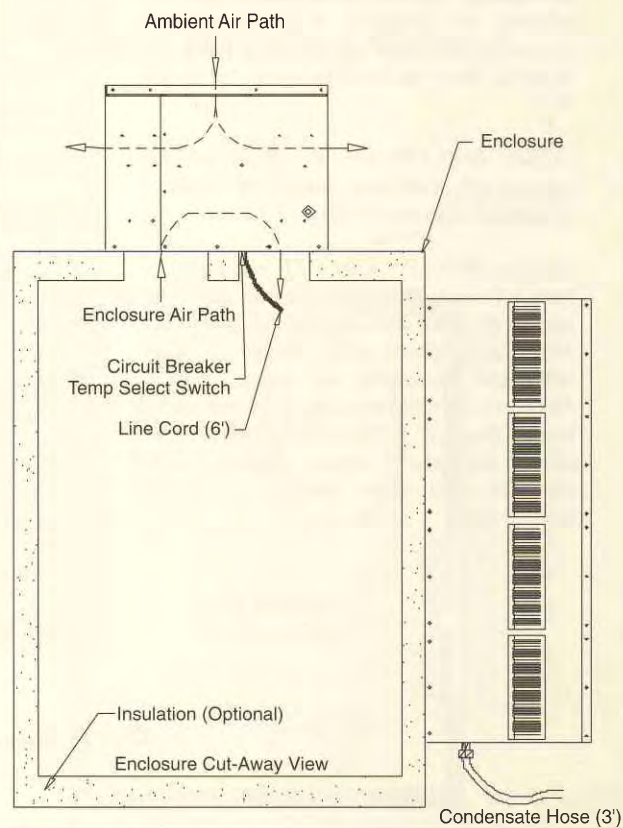


Performance Curve: FHP-2852



Ambient	25°C	60°C
Enclosure	$y = .0822x - 37$	$y = .0857x - 42$

Typical Mounting Method



AHP-1801, AHP-1801X, AHP-1801XP Solid-State Air Conditioners, Thru Mount Explosion Proof (Hazardous Duty) and Nema-4X Models

Fin Rating 1150-1400 Btu/h; Air Rating 900-1050 Btu/h, Heating: 1360 Btu/h (Opt.)

Features:

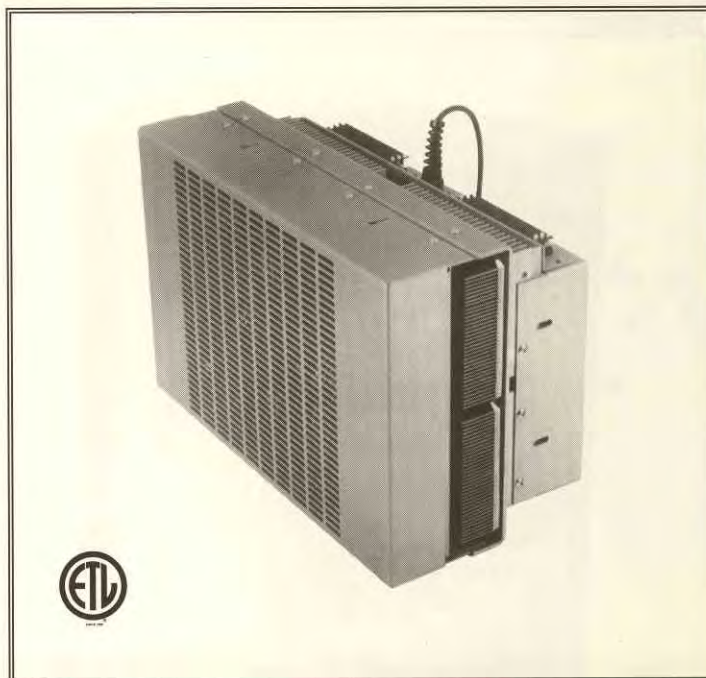
- Hazardous Duty and Nema-4X Models
- No Compressor, Fluorocarbons, or Filters
- Maintenance Free Operation
- 115 or 230 VAC Input (Field Selectable)
- Mounts in any Orientation
- Mil-Spec. Fans on Nema-4X Models

Models:

- AHP-1801 (Nema-12)
- AHP-1801X (Nema-4X)
- AHP-1801XP (Nema-4X, Explosion Proof)

(Designed for Class I and II, Division 2 and Class III,

Division 1 & 2)



Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only!

Model AHP-1801XP is designed for hazardous locations such as Class I Division 2 (Groups A-D).

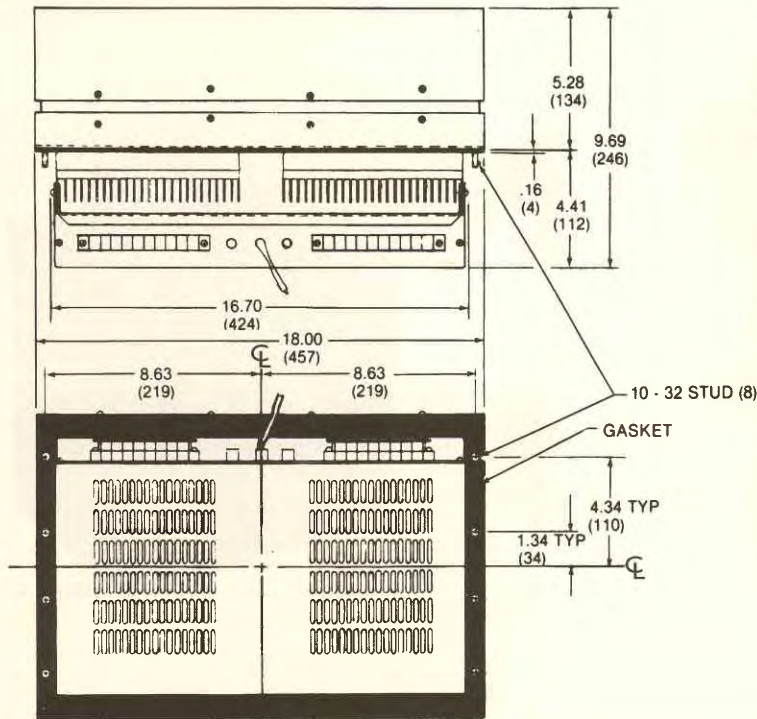
Models AHP-1801X and XP are ideal for harsh Nema-4X environments such as chemical, steel and paper mills, foundries and food processing plants. Can withstand corrosive salt spray, shock, vibration, windblown dust, rain and water hose down in outdoor and indoor use. Cools equipment racks, drives, motor controls and other remote electronic equipment.

SPECIFICATIONS:

Cool Only Models	AHP-1801	AHP-1801X	AHP-1801XP
Input AC Voltage	115/230	115/230	115/230
Current @ 115V	6.8-7.5 Amps	6.8-7.5 Amps	6.8-7.5 Amps
Current @ 230V	4.2-4.9 Amps	4.2-4.9 Amps	4.2-4.9 Amps
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Minimum Ambient	-28°C / -20°F	-28°C / -20°F	-28°C / -20°F
Maximum Ambient	+70°C / +158°F	+80°C / +176°F	+80°C / +176°F
Nema Rating	12	4X	4X
Weight	46 lbs. / 20.9 Kg.	46 lbs. / 20.9 Kg	46 lbs. / 20.9 Kg
Standard(s) ETL/ETLc Approved	ANSI/UL 1995 CAN/CSA-C22.2 No. 236-M90	ANSI/UL 1995 CAN/CSA-C22.2 No. 236-M90	ANSI/UL 1604 (Hazardous Duty)
Corrosion Resistance		Mil-Std 810	Mil-Std 810
Thermostat	TC-6F	TC-6F	TC-6F
Cool & Heat Models	AHP-1801HC	AHP-1801XHC	AHP-1801XPHC
Thermostat	TC-3F	TC-3F	TC-3F

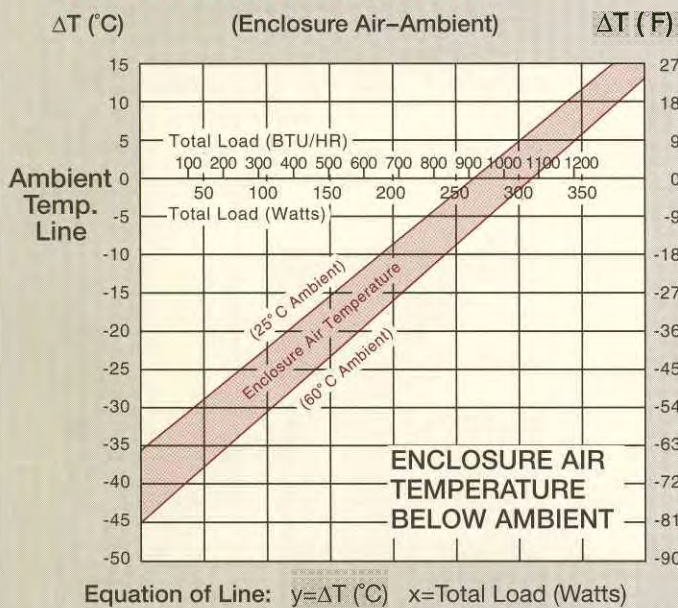
☎ Toll Free (888) TECA USA or (832-2872)

Dimensions:



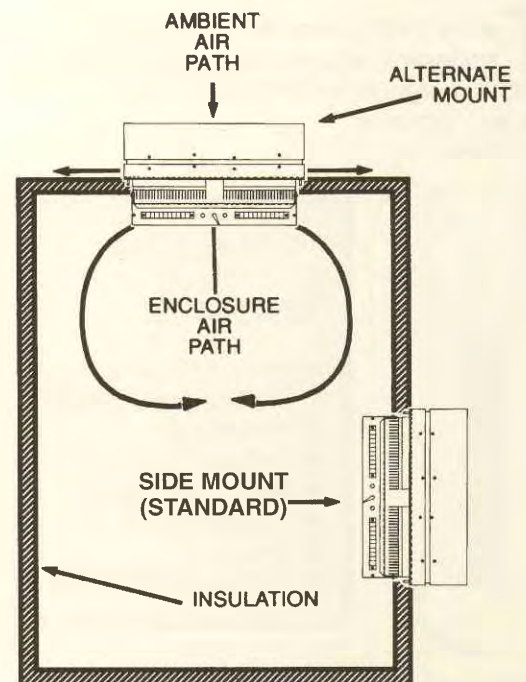
NOTE Dimensions:
Inches (millimeters)

Performance Curve: AHP-1801/1801X/1801XP



	115 VAC		230 VAC	
Ambient	25°C	60°C	25°C	60°C
Enclosure	$y = .137x - 35.8$	$y = .143x - 41.0$	$y = .136x - 38.1$	$y = .147x - 45.2$
Cold Sink	$y = .112x - 37.4$	$y = .110x - 43.0$	$y = .104x - 38.9$	$y = .113x - 46.1$

Typical Mounting Method



Fin Rating 1200-1350 Btu/Hr
(Ambient to Cold Side Fin)

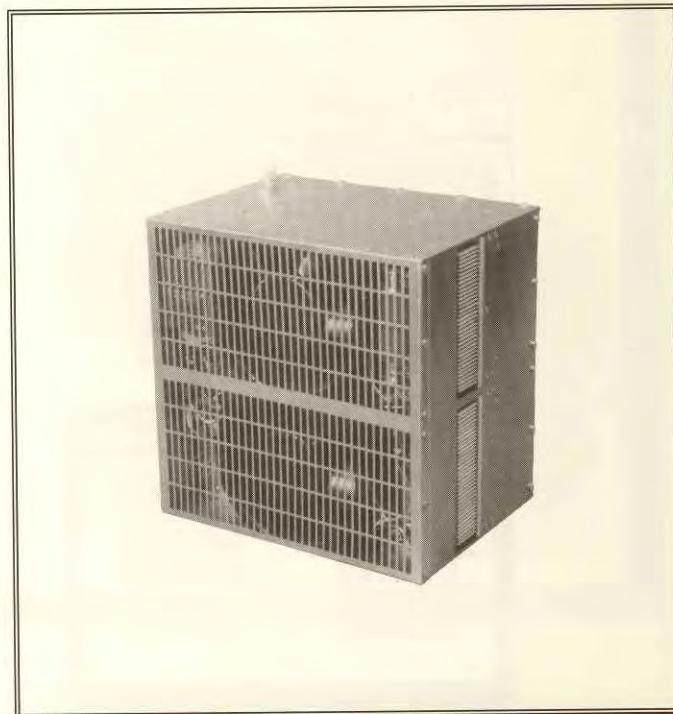
Air Rating 850-950 Btu/Hr
(Ambient to Cold Side Air)

Features:

- Flush (External) Mount
- Compact, only (12" L x 12" W x 9" D)
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Stainless Steel Exterior Housing
- Nema-12 Rating Maintained
- Mounts in any Orientation

Includes:

- Integral Power Supply (115 VAC Input)
- Condensate Removal System
- TC-6F Thermostat



Cools Equipment Racks, PC's, Drives, Amplifiers, Motor Controls, & Other Electronic Equipment

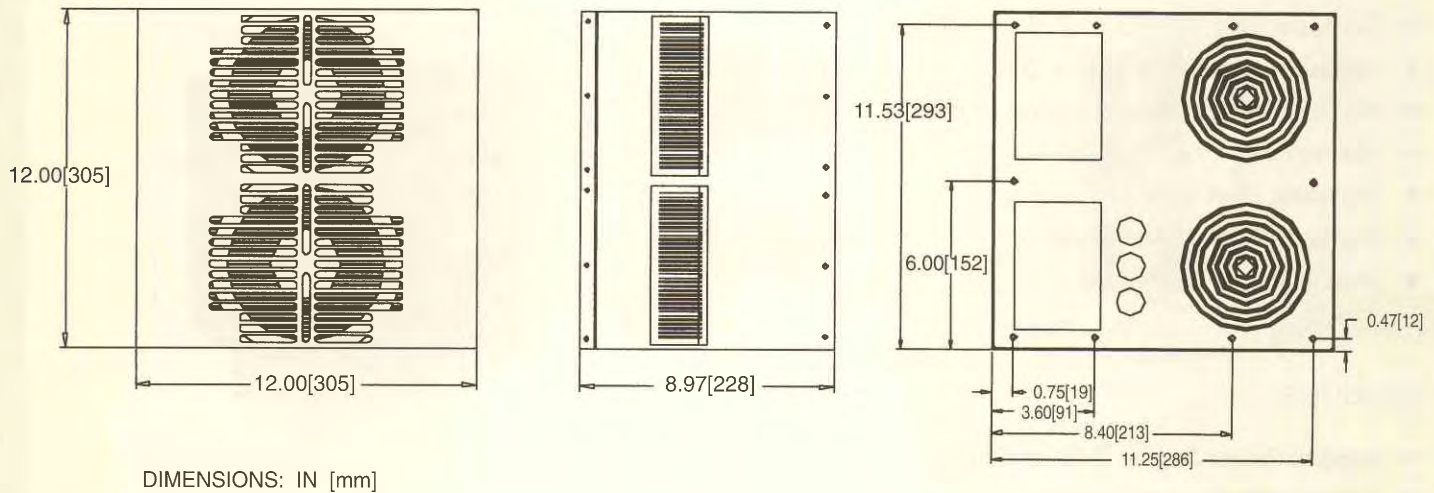
Teca's FHP-Series air conditioners are designed for tightly packaged enclosures. There is no intrusion within the enclosure, allowing for greater design flexibility. Model FHP-1450 is designed for 115 VAC applications, model FHP-1452 is designed for 230 VAC. Ideal for harsh Nema-12 environments such as steel and paper mills, foundries and food processing plants.

SPECIFICATIONS:

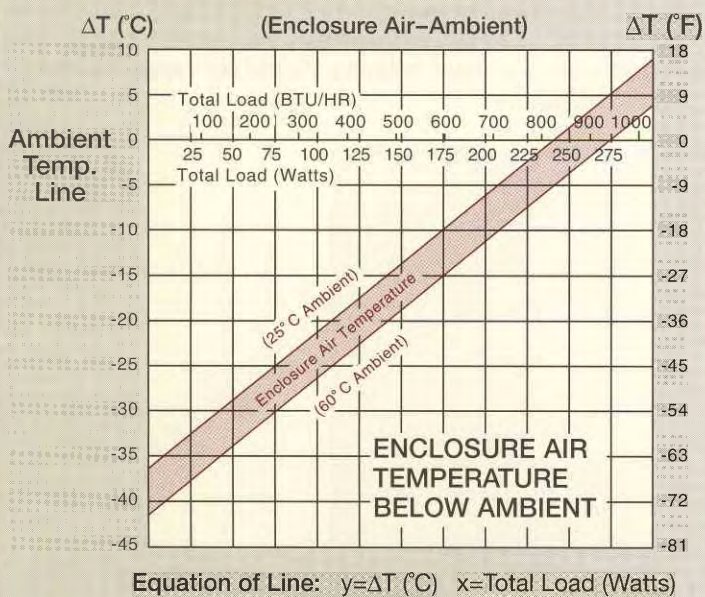
Model Number	FHP-1450	FHP-1452
• Input Voltage	115 VAC	230 VAC
• Input Current (Rms)	9.0-9.5 Amps	6.0 Amps
• Frequency	50/60 Hz	50/60 Hz
• Minimum Ambient	-10°C / +14°F	-10°C / +14°F
• Maximum Ambient	+70°C / + 158°F	+70°C / + 158°F
• Enclosure Rating	Nema-12	Nema-12
• Weight	32 lbs. / 14.5 Kg.	32 lbs. / 14.5 Kg.
• Temperature Control	TC-6F (Included)	TC-6F (Included)

☎ Technical Support Toll Free (888) TECA USA or (888) 832-2872

Dimensions:

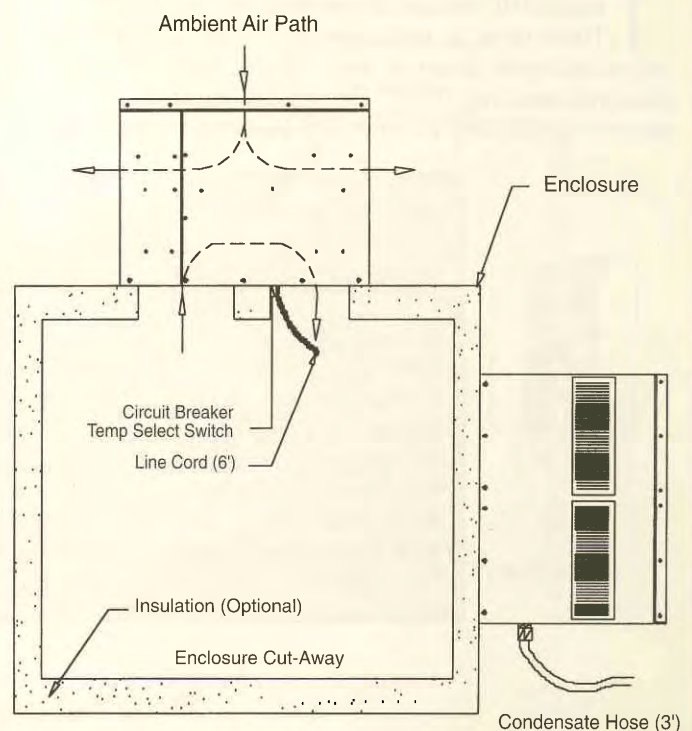


Performance Curve: FHP-1450/1452



Ambient	25°C	60°C
Enclosure	$y = .154x - 37$	$y = .153x - 42$

Typical Mounting Method



AHP-1400

Solid-State Air Conditioner, Thru Mount

Fin Rating 950-1025 Btu/Hr
(Ambient to Cold Side Fin)

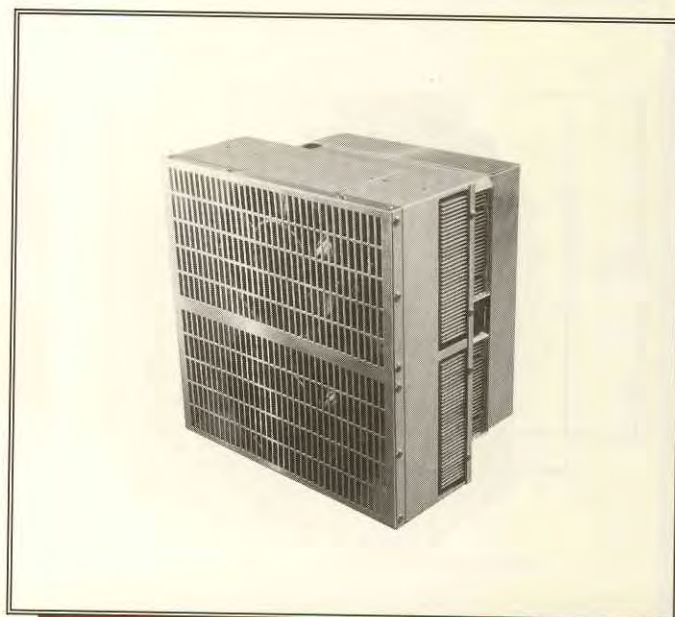
Air Rating 685-850 Btu/Hr
(Ambient to Cold Side Air)

Features:

- Solid State Operation
- Compact, only (12" L x 12" W x 9.22" D)
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Stainless Steel Exterior Housing
- Nema-12 Rating Maintained
- Mounts in any Orientation

Includes:

- Integral Power Supply (115 VAC Input)
- Condensate Removal System
- TC-6F Thermostat



Cools Equipment Racks, PC's, Drives, Amplifiers, Motor Controls, & Other Electronic Equipment

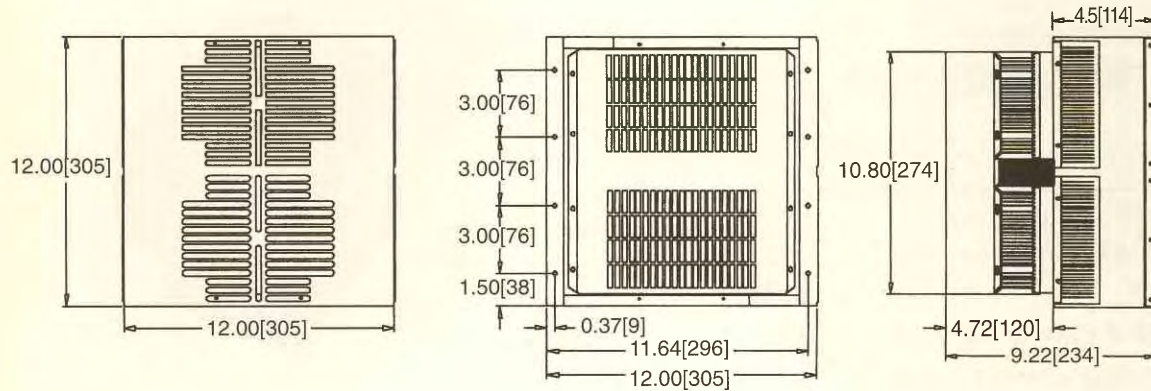
Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only! Model AHP-1400 replaces our AHP-1700 unit. It is 33% smaller with the same capacity, and also includes the TC-6F thermostat, condensate removal system, and stainless steel housing. Ideal for harsh Nema-12 environments such as steel and paper mills, foundries and food processing plants.

SPECIFICATIONS:

Model Number	AHP-1400
• Input Voltage	115 VAC (Optional 230 VAC, Consult Factory)
• Input Current	7.5-8.9 Amps RMS
• Frequency	50/60 Hz
• Minimum Ambient	-10°C / +14°F
• Maximum Ambient	+70°C / + 158°F
• Enclosure Rating	Nema-12
• Weight	31 lbs. / 14 Kg.
• Temperature Control	TC-6F (Included)

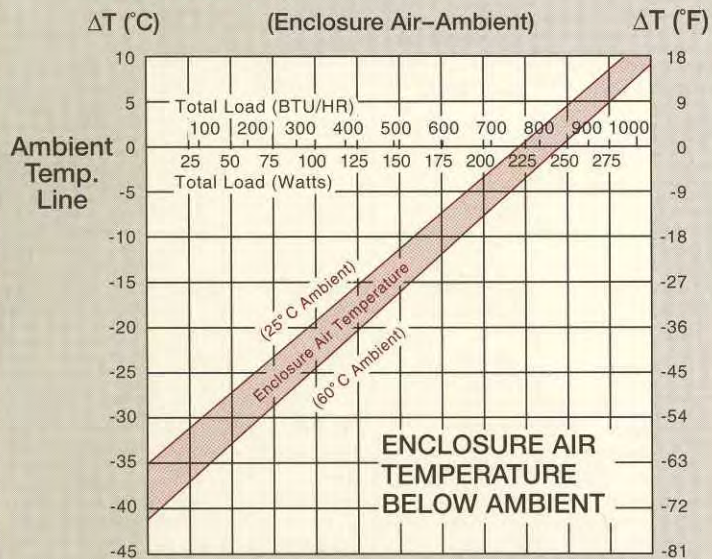
 Toll Free (888) TECA USA (832-2872)

Dimensions:



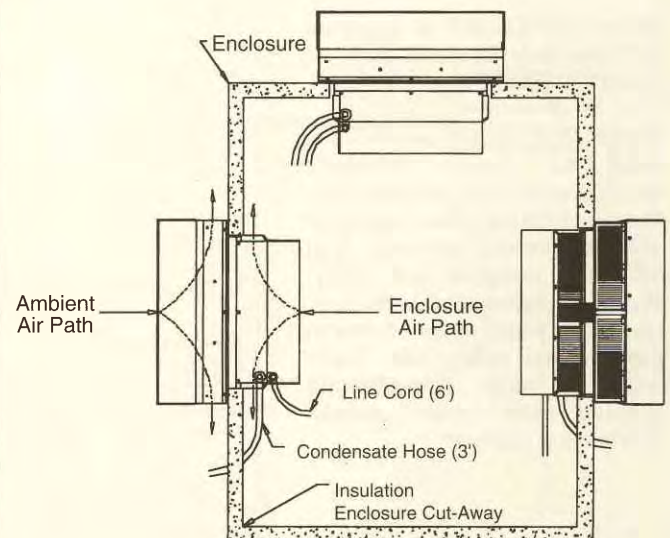
Dimensions: In [mm]

Performance Curve: AHP-1400



Ambient	25°C	60°C
Enclosure	$y = .159x - 35$	$y = .171x - 42$

Typical Mounting Method



AHP-1200,(FF,X,XM,XP) & AHP-1201 Solid-State Air Conditioners, Thru Mount Explosion Proof (Hazardous Duty) and Nema-4X Models

Fin Rating 625-700 Btu/h; Air Rating 450-500 Btu/h, Heating: 680 Btu/h (Opt.)

Features:

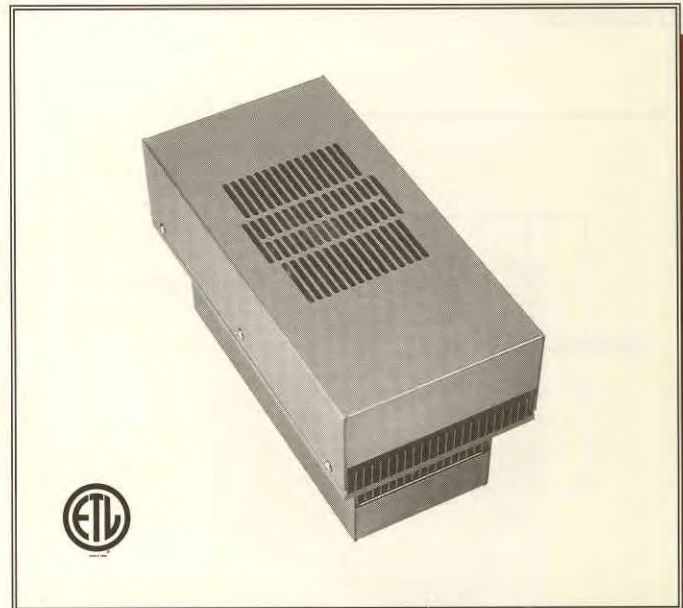
- Hazardous Duty and Nema-4X Models
- No Compressor, Fluorocarbons, or Filters
- Maintenance Free Operation
- Mounts in any Orientation
- Mil-Spec. Fans on Nema-4X Models

Models:

Nema:

- | | |
|--------------------------------|------|
| • AHP-1200FF (115 VAC) | (12) |
| • AHP-1201 (230 VAC) | (12) |
| • AHP-1200X | (4X) |
| • AHP-1200XM (Shock/Vibration) | (4X) |
| • AHP-1200XP (Explosion Proof) | (4X) |

(Designed for Class I and II, Division 2 and Class III, Division 1 & 2)



SPECIFICATIONS

Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only!

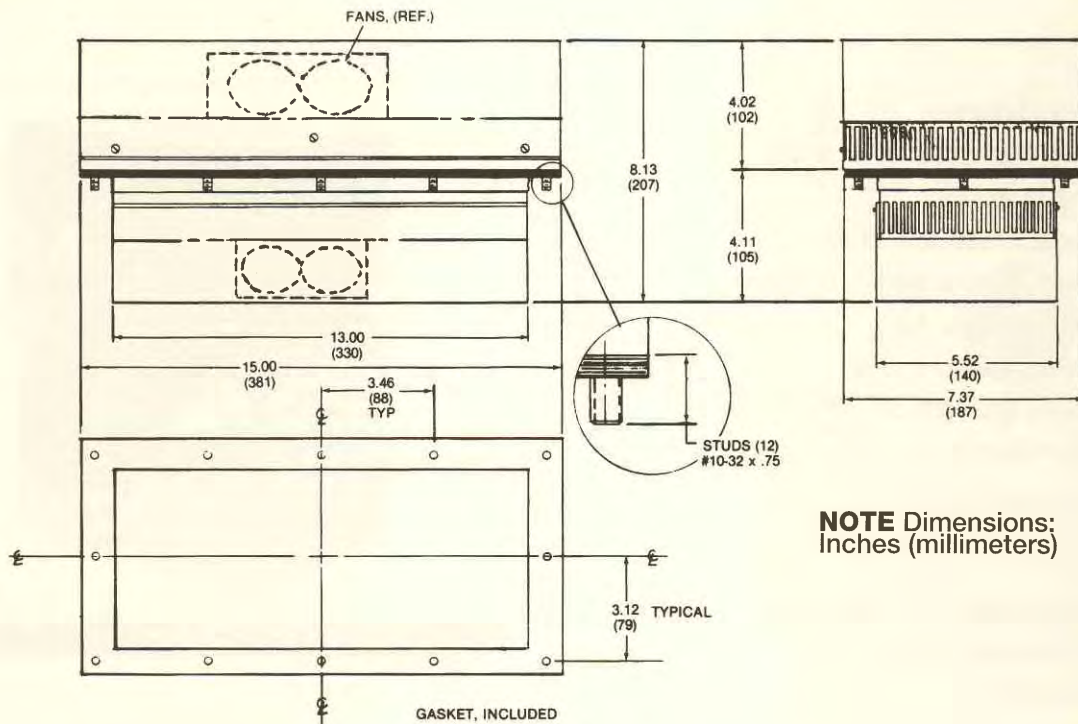
Model AHP-1200XP is designed for hazardous locations such as Class I Division 2 (Groups A-D).

Models AHP-1200X and XP are ideal for harsh Nema-4X environments such as chemical, steel and paper mills, foundries and food processing plants. Can withstand corrosive salt spray, shock, vibration, windblown dust, rain and water hose down in outdoor and indoor use. Cools equipment racks, drives, motor controls and other remote electronic equipment.

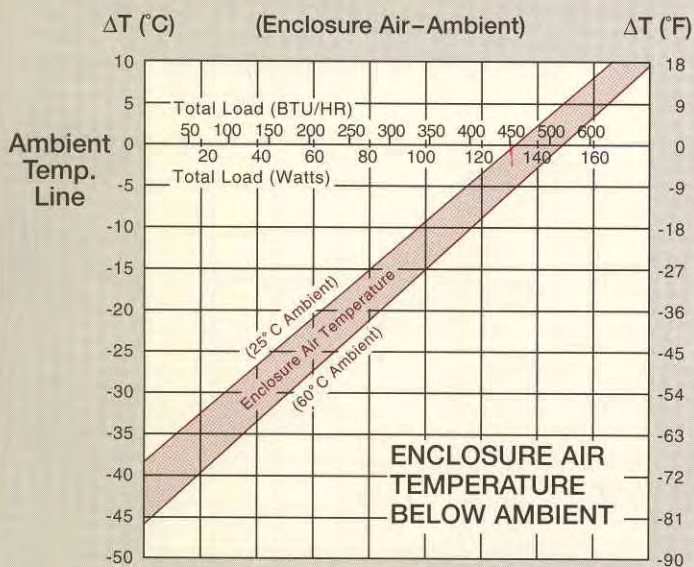
Cool Only Models	AHP-1200FF	AHP-1201	AHP-1200X	AHP-1200XM	AHP-1200XP
AC Voltage	115	115/230	115	115	115
Current ,Amps	3.8-4.0	3.8/2.2	3.8-4.0	3.8-4.0	3.8-4.0
Frequency, Hz	50/60	50/60	50/60	50/60	50/60
Min. Ambient (°C/°F)	-28/-20	-28/-20	-28/-20	-28/-20	-28/-20
Max. Ambient (°C/°F)	+70/+158	+70/+158	+80/+176	+80/+176	+80/+176
Nema Rating	12	12	4X	4X	4X
Weight (lb/Kg)	21/9.5	28/12.7	21/9.5	21/9.5	21/9.5
Standard(s) ETL ETLc	UL-1995 CSA 22.2	UL-1995 CSA 22.2	UL-1995 CSA 22.2	UL-1995 CSA 22.2	UL-1604
Corrosion Shock/Vib.			Mil-810	Mil-810 Mil-810	Mil-810
Thermostat	TC-6F	TC-6F	TC-6F	TC-6F	TC-6F
Cool & Heat Models	AHP-1200FFHC	AHP-1201HC	AHP-1200XHC	AHP-1200XMHC	AHP-1200XPHC
Thermostat	TC-3F	TC-3F	TC-3F	TC-3F	TC-3F

 Toll Free (888) TECA USA or (832-2872)

Dimensions:



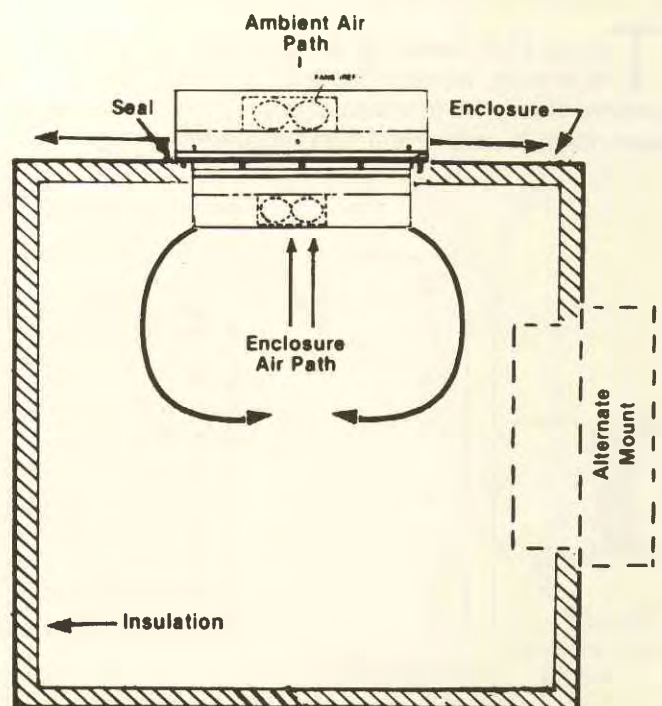
Performance Curve: AHP-1200FF/1201FF/1200X/1200XP



Equation of Line
 $y = \Delta T (^{\circ}\text{C})$
 $x = \text{Total Load (Watts)}$

Ambient Temp.	25°C	60°C
Enclosure	$y = .30x - 38.9$	$y = .31x - 45.6$
Cold Sink	$y = .22x - 40.3$	$y = .23x - 47.0$

Typical Mounting Method



Fin Rating 650-725 Btu/Hr
(Ambient to Cold Side Fin)

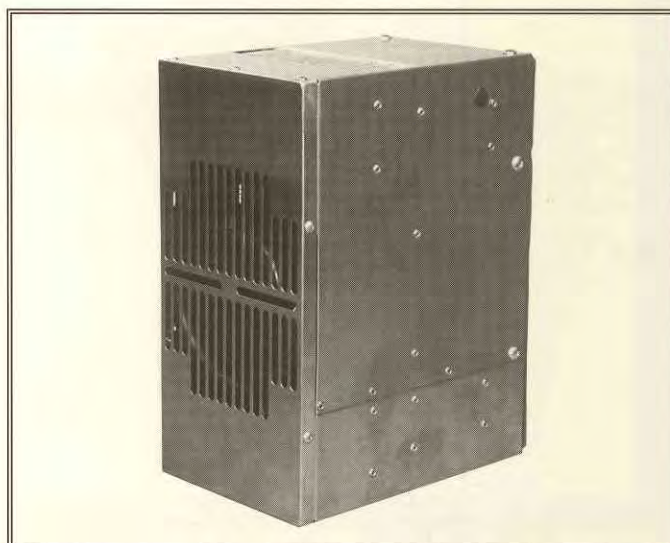
Air Rating 450-500Btu/Hr
(Ambient to Cold Side Air)

Features:

- Flush (External) Mount
- Compact, only (12" L x 6" W x 9" D)
- Weighs only 16 Lbs.
- Ambient Range, -10° C to +70° C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Stainless Steel Exterior Housing
- Nema-12 Rating Maintained
- Mounts in any Orientation

Includes:

- Integral Power Supply (115 VAC Input)
- Condensate Removal System
- TC-6F Thermostat



Cools Equipment Racks, PC's, Drives, Amplifiers, Motor Controls, & Other Electronic Equipment

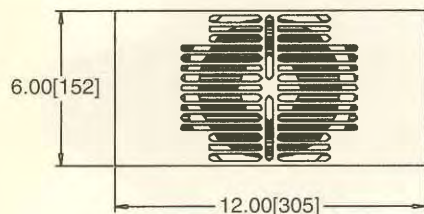
Teca's FHP-Series air conditioners are designed for tightly packaged enclosures. There is no intrusion within the enclosure, allowing for greater design flexibility. Model FHP-750 is the smallest flush mount we offer. An external footprint of only 1/2 ft² makes this unit perfect for small enclosures. Ideal for harsh Nema-12 environments such as steel and paper mills, foundries and food processing plants.

SPECIFICATIONS:

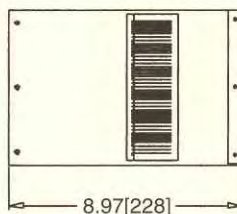
Model Number	FHP-750
• Input Voltage	115 VAC
• Input Current	4.2-5.0 Amps RMS
• Frequency	50/60 Hz
• Minimum Ambient	-10° C / +14° F
• Maximum Ambient	+70° C / + 158° F
• Enclosure Rating	Nema-12
• Weight	16 lbs. / 7.25 Kg.
• Thermostat	TC-6F (Included)

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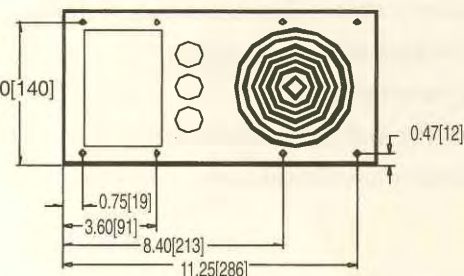
Dimensions:



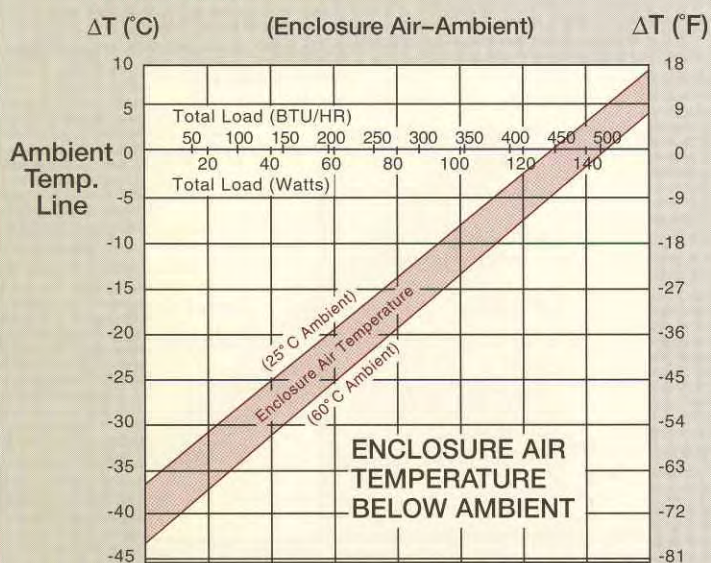
Dimensions: In [mm]



Dimensions: In [mm]



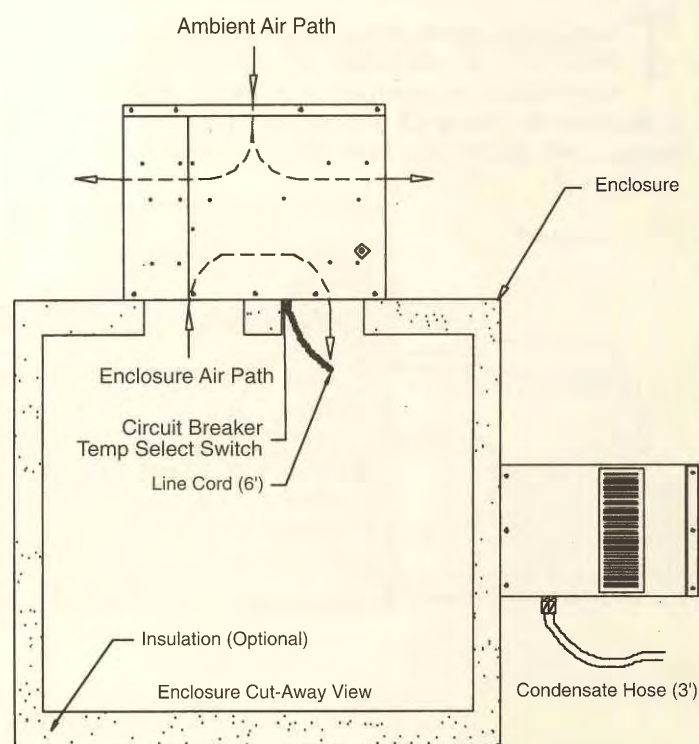
Performance Curve: FHP-750



Equation of Line: $y = \Delta T (^{\circ}\text{C})$ $x = \text{Total Load (Watts)}$

Ambient	25°C	60°C
Enclosure	$y = .285x - 37$	$y = .297x - 43$

Typical Mounting Method



AHP-300FF, AHP-300X

Solid-State Air Conditioner, Thru Mount Nema-12 and Nema-4X Models

Fin Rating 235-275Btu/Hr
(Ambient to Cold Side Fin)

Air Rating 185-210Btu/Hr
(Ambient to Cold Side Air)

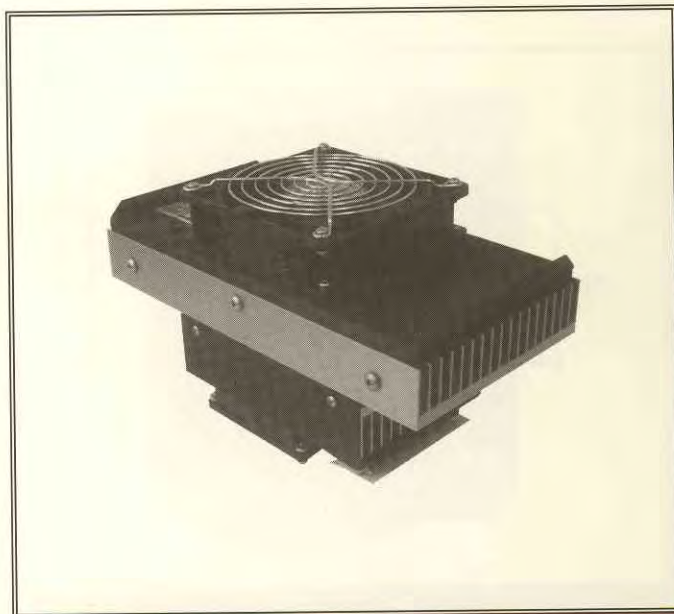
Heating: 245 Btu/Hr
72 Watts (Optional)

Features:

- DC Input (Field Selectable 12/24/48)
- Compact, only (10" L x 5.75" W x 6.37" D)
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Weighs only 7.5 Lbs.
- Nema-12 and Nema-4X Models
- Mounts in any Orientation

Options:

- Heating (72 Watts, 24 VDC only)
- TC-6FDC Thermostat



Cools small enclosures containing Computers, Cameras, VCR's & other Sensitive Electronics

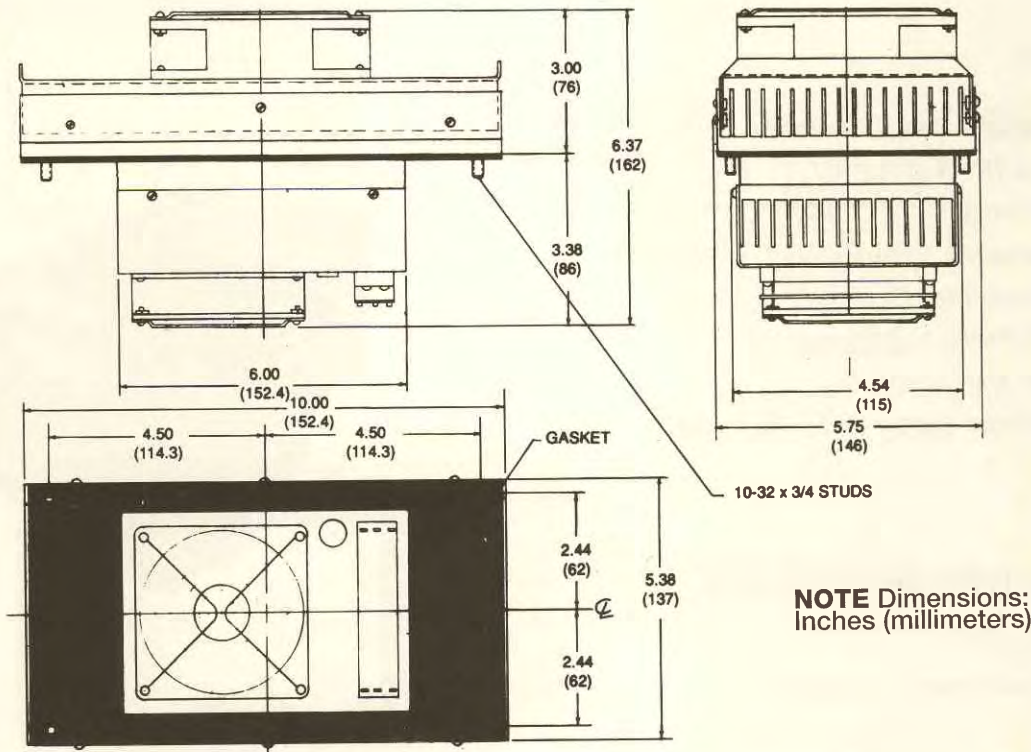
Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only! Model AHP-300FF is designed for DC input and Nema-12 enclosures. Model AHP-300X is designed for Nema-4X enclosures. We offer a power supply for the AHP-300X if DC is not available, model PS300-24X. Models AHP-300FF and AHP-300X are ideal for harsh and mobile environments.

SPECIFICATIONS:

Model Number	AHP-300FF	AHP-300X
• Input Voltage	12/24/48	12/24/48
• Input Current	12.5/6.3/3.1 Amps	12.5/6.3/3.1 Amps
• Minimum Ambient	-10°C / +14°F	-28°C / -20°F
• Maximum Ambient	+70°C / + 158°F	+80°C / + 176°F
• Enclosure Rating	Nema-12	Nema-4X
• Weight	7.5 lbs. / 3.4 Kg.	7.5 lbs. / 3.4 Kg.
• Thermostat	Optional	Optional

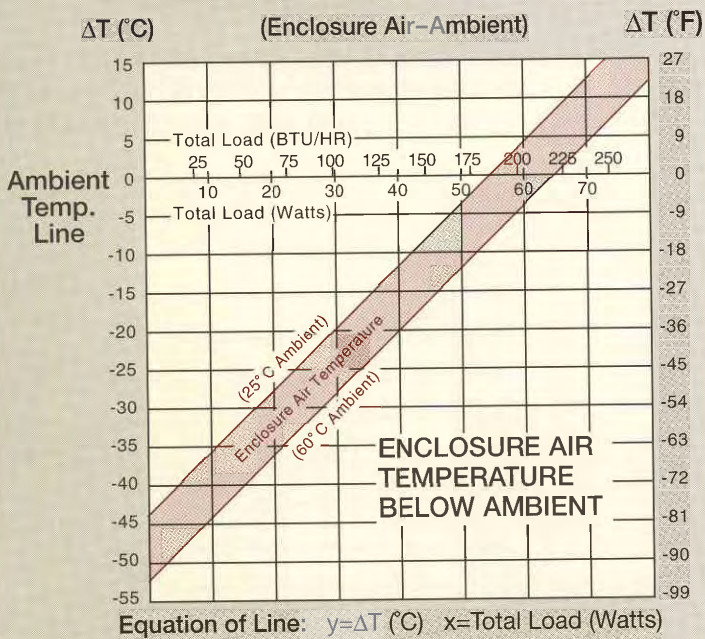
 Toll Free (888) TECA USA (832-2872)

Dimensions:



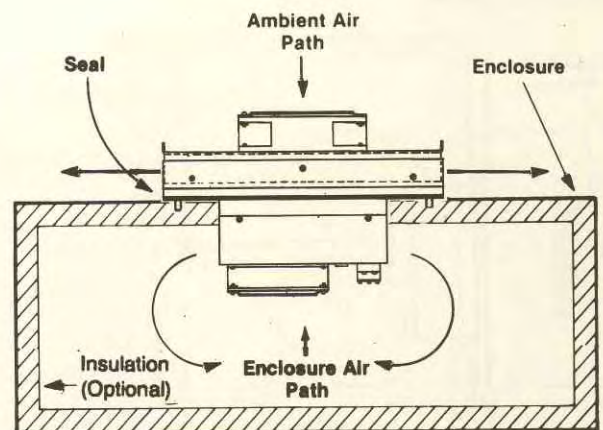
NOTE Dimensions:
Inches (millimeters)

Performance Curve: AHP-300FF/300X



Ambient Temp.	25°C	60°C
Enclosure	$y = .82x - 44.3$	$y = .86x - 53.3$

Typical Mounting Method



Fin Rating 210-230 Btu/Hr
(Ambient to Cold Side Fin)

Air Rating 160-200 Btu/Hr
(Ambient to Cold Side Air)

Heating: 340 Btu/Hr
100 Watts (Optional)

Features:

- Our Smallest AC Input System!
(10" L x 5.75" W x 8.6" D)
- Ambient Range, -28°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Nema-12 Rating Maintained
- Mounts in any Orientation
- Integral Power Supply (115 VAC Input)

Options:

- Heat/Cool Model, AHP-301FFHC
(includes TC-3F Thermostat)
- TC-6F Thermostat (Cool Only)



Cools Equipment Racks, PC's, Drives, Cameras, Motor Controls, & Other Electronic Equipment

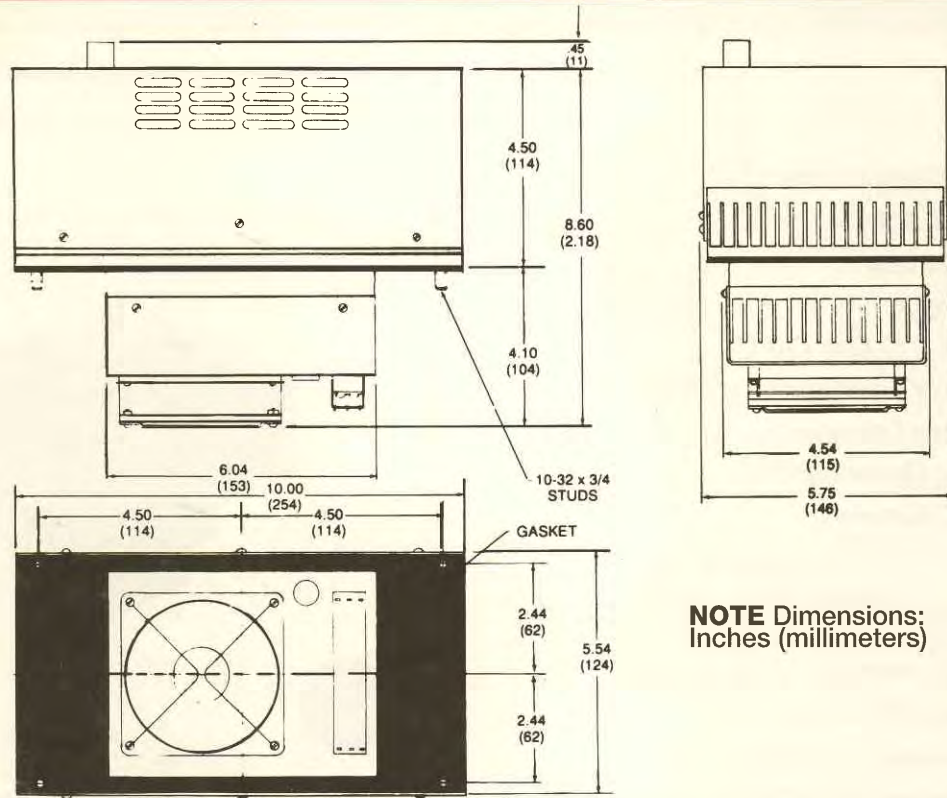
Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only! Ideal for harsh Nema-12 environments such as steel and paper mills, foundries and food processing plants.

SPECIFICATIONS:

Model Number	AHP-301FF
• Input Voltage	115/230 VAC
• Input Current	1.2/0.6 Amps
• Frequency	50/60 Hz
• Minimum Ambient	-28°C / -20°F
• Maximum Ambient	+70°C / + 158°F
• Enclosure Rating	Nema-12
• Weight	12 lbs. / 5.4 Kg.

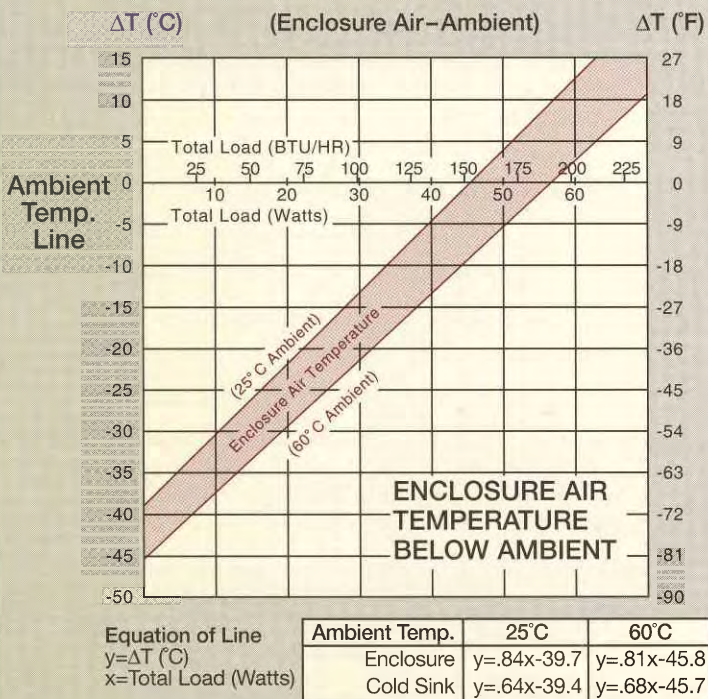
☎ Toll Free (888) TECA USA (832-2872)

Dimensions:

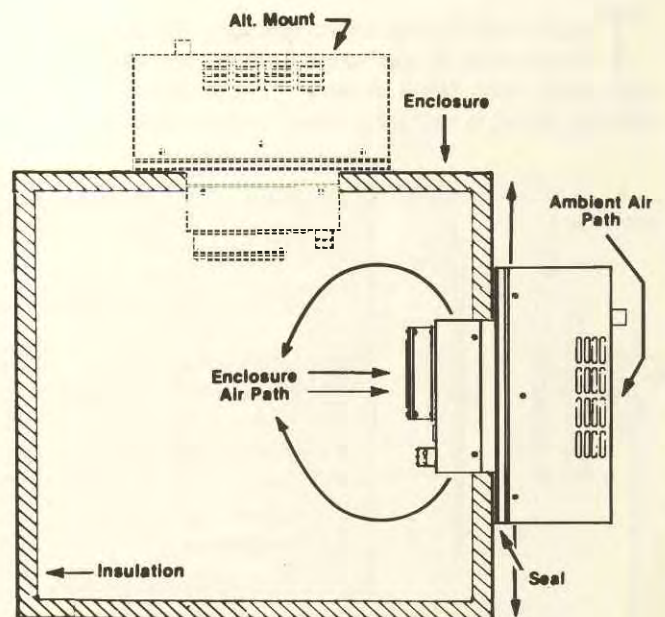


NOTE Dimensions:
Inches (millimeters)

Performance Curve: AHP-301FF



Typical Mounting Method



Fin Rating 110-135 Btu/Hr
(Ambient to Cold Side Fin)

Air Rating 90-110 Btu/Hr
(Ambient to Cold Side Air)

Heating: 245Btu/Hr
72 Watts (Optional)

Features:

- Our Smallest DC Input System!
(7" L x 5" W x 6.2" D)
- Weighs only 3.25 Lbs.
- 12 or 24 VDC Input
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Nema-12 Rating Maintained
- Mounts in any Orientation

Options:

- Heat/Cool Model, AHP-150FFHC (24 VDC)
- DC Power Supply (PS80-12)
- TC-6FDC Thermostat (Cool Only)
- TC-3FDC Thermostat (Heat/Cool)



Cools Video Surveillance Equipment, Cameras, Computers & Other Electronic Equipment

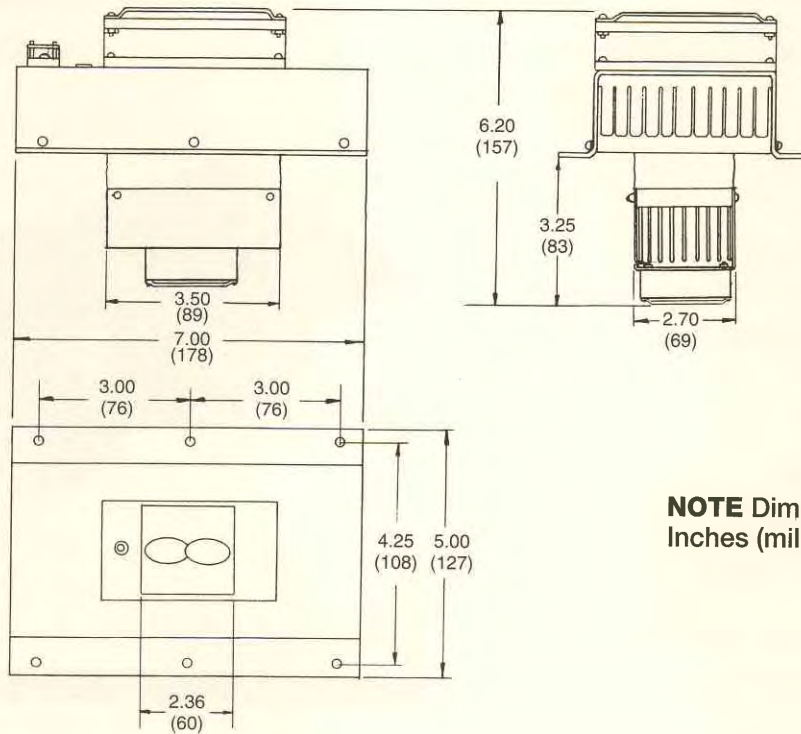
Teca's AHP-Series air conditioners are designed to mount with portions on both the inside and outside of the enclosure. There is no air exchange from internal to ambient. A stud/gasketed mounting insures your Nema integrity. Internal fans recirculate cool, clean air only! Due to space constraints, wiring is terminated from the hot (ambient) side on this model. If internal wiring is required, please consult factory. Ideal for harsh remote environments.

SPECIFICATIONS:

Model Number	AHP-150FF
• Input Voltage	12/24 VDC (Factory Wired for 12 VDC)
• Input Current	5.0/2.5 Amps
• Minimum Ambient	-10°C / +14°F
• Maximum Ambient	+70°C / + 158°F
• Enclosure Rating	Nema-12
• Weight	3.25 lbs. / 1.5 Kg.
• Thermostat	Optional

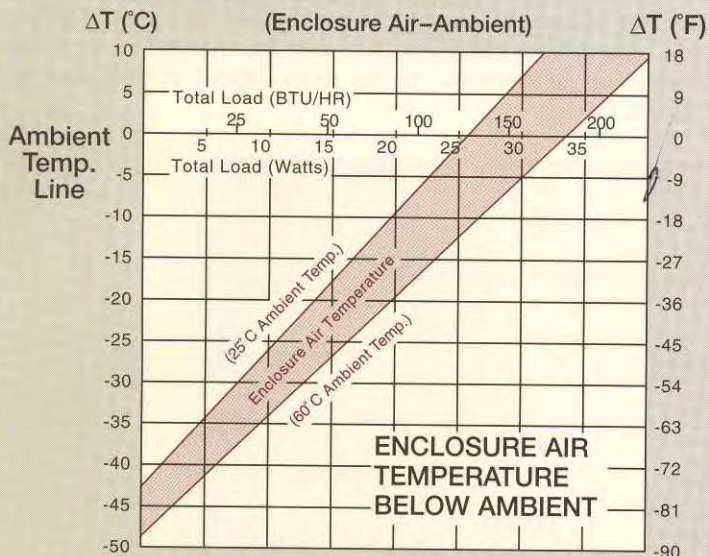
 Toll Free (888) TECA USA (832-2872)

Dimensions:



NOTE Dimensions:
Inches (millimeters)

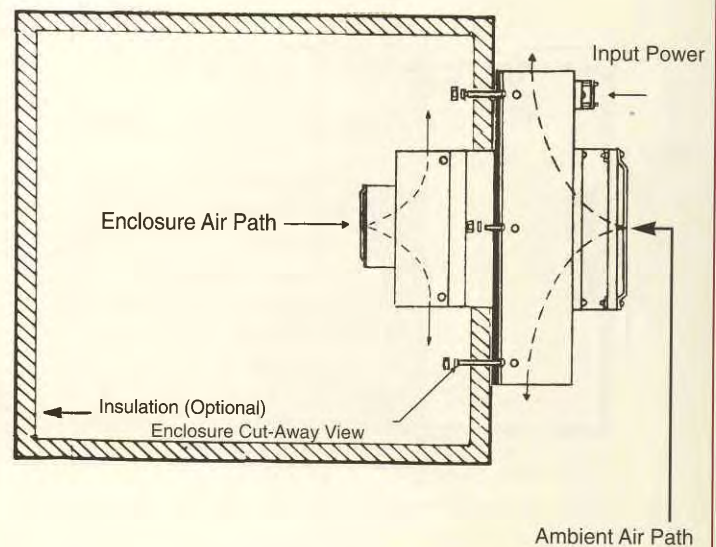
Performance Curve: AHP-150FF



Equation of Line: $y = \Delta T$ (°C) $x = \text{Total Load (Watts)}$

Ambient	25°C	60°C
Enclosure	$y = 1.65x - 43$	$y = 1.48x - 49$

Typical Mounting Method



LHP-1700FF, LHP-1702FF

Solid-State Air Conditioner, Liquid Cooled

Air Rating (LHP-1702FF) 1050-1300 Btu/Hr
(Liquid Inlet to Cold Side Air)

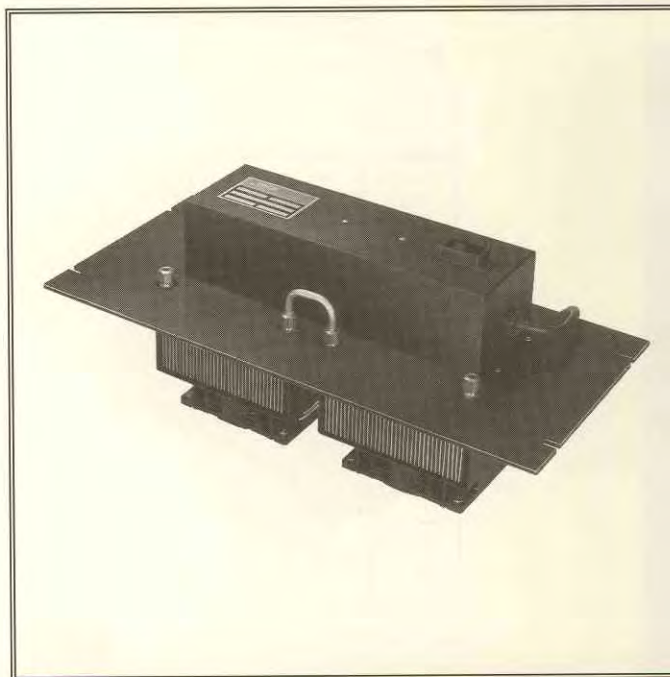
Air Rating (LHP-1700FF) 900-1000 Btu/Hr
(Liquid Inlet to Cold Side Air)

Features:

- Standard 19" Rack Mount
- Compact, only (19" L x 8.75" W x 8.8" D)
- Ambient Range, -30°C to +80°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Adaptable to Explosion-Proof Applications
- Available in 115 or 230 VAC
- Mounts in any Orientation
- Includes integral power supply

Options:

- Heaters (400 Watts)
 - Model: LHP-1700FFHC (incl. TC-3F)
 - Model: LHP-1702FFHC (incl. TC-3F)
- Temperature Control



Applications in Pulp and Paper Mills, Machine Tools, & Electronics

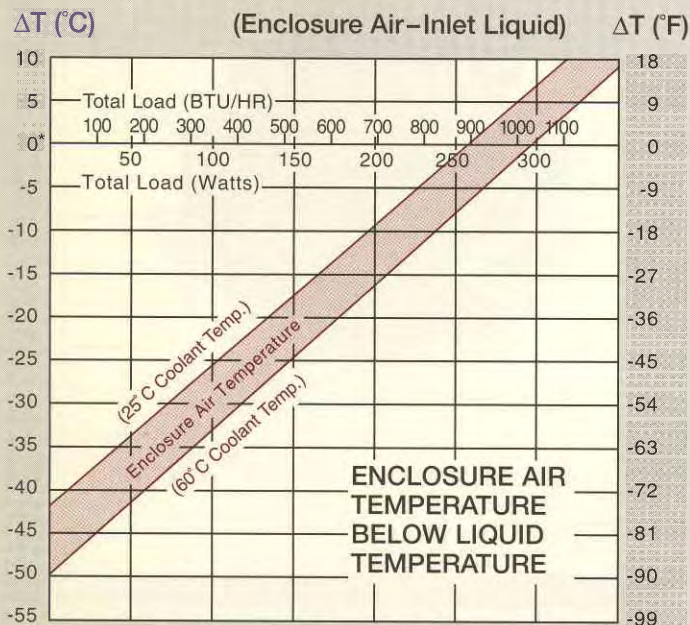
Teca's LHP-Series air conditioners are constructed with anodized aluminum liquid jackets with stainless steel fittings. You provide a constant flow of liquid as a heat removal source. Combining these features with thermoelectric modules make the LHP-series capable of both high capacity and high temperature differentials. Model LHP-1700FF is designed for 115 VAC applications and model LHP-1702FF is designed for 230 VAC input.

SPECIFICATIONS:

Model Number	LHP-1700FF	LHP-1702FF
• Input Voltage	115 VAC	230 VAC
• Input Current	6.3-7.3 Amps RMS	5.9-6.6 Amps RMS
• Frequency	50/60 Hz	50/60 Hz
• Minimum Ambient	-30°C / -21°F	-30°C / -21°F
• Maximum Ambient	+80°C / + 176°F	+80°C / + 176°F
• Minimum Flow Rate	0.5 GPM (2 L/M)	0.5 GPM (2 L/M)
• Enclosure Rating	Nema-12	Nema-12
• Weight	21 lbs. / 9.8 Kg.	21 lbs. / 9.8 Kg.
• Thermostat	Optional	Optional

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Performance Curve: LHP-1700FF



Equation of Line

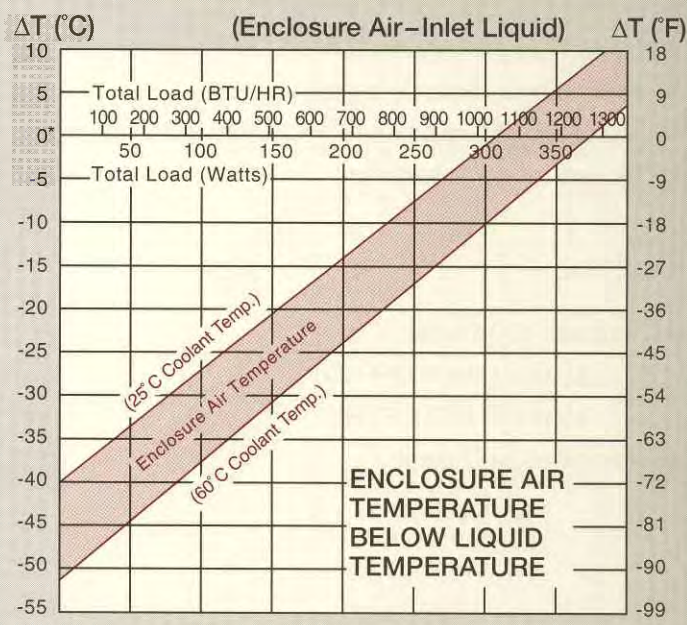
$y = \Delta T (^{\circ}\text{C})$

$x = \text{Total Load (Watts)}$

Liquid Temp.	25°C	60°C
Enclosure	$y = .16x - 47.0$	$y = .14x - 51.0$

*Inlet Liquid Temp. Line

Performance Curve: LHP-1702FF



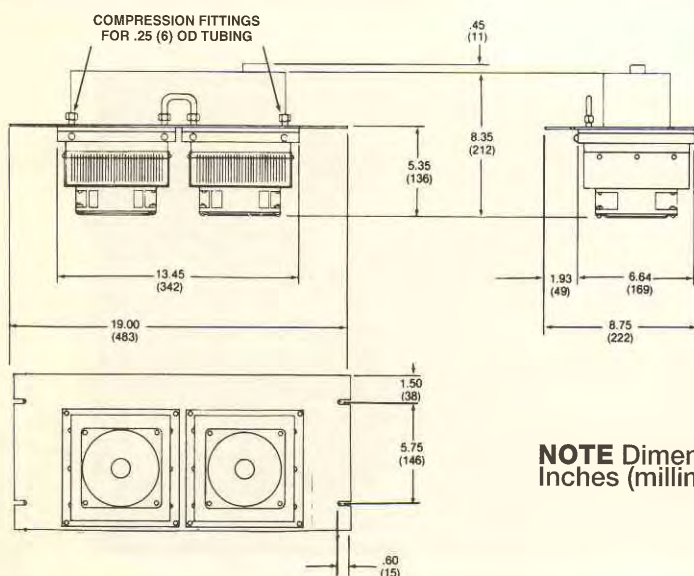
Equation of Line

$y = \Delta T (^{\circ}\text{C})$

$x = \text{Total Load (Watts)}$

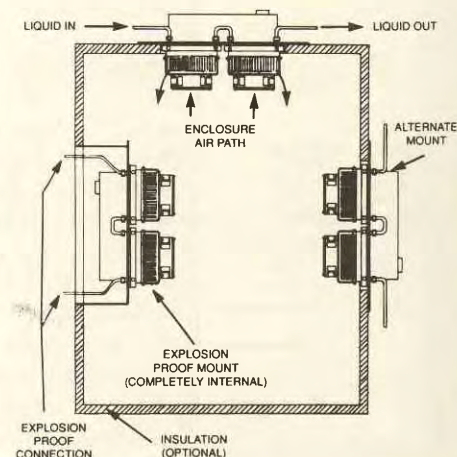
Liquid Temp.	25°C	60°C
Enclosure	$y = .129x - 40$	$y = .139x - 52$

*Inlet Liquid Temp. Line



NOTE Dimensions:
Inches (millimeters)

Typical Mounting Method



Air Rating (LHP-800FF) 500-575 Btu/Hr
(Liquid Inlet to Cold Side Air)

Air Rating (LHP-810FF) 550-650Btu/Hr
(Liquid Inlet to Cold Side Air)

Features:

- Compact, only (8.06" L x 6.62" W x 5.5" D)
- Ambient Range, -30°C to +80°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Adaptable to Explosion-Proof Applications
- Mounts in any Orientation

Options:

- Heaters (200 Watts)
Model: LHP-800FFHC
Model: LHP-810FFHC
- Temperature Control



Applications in Pulp and Paper Mills, Machine Tools, & Electronics

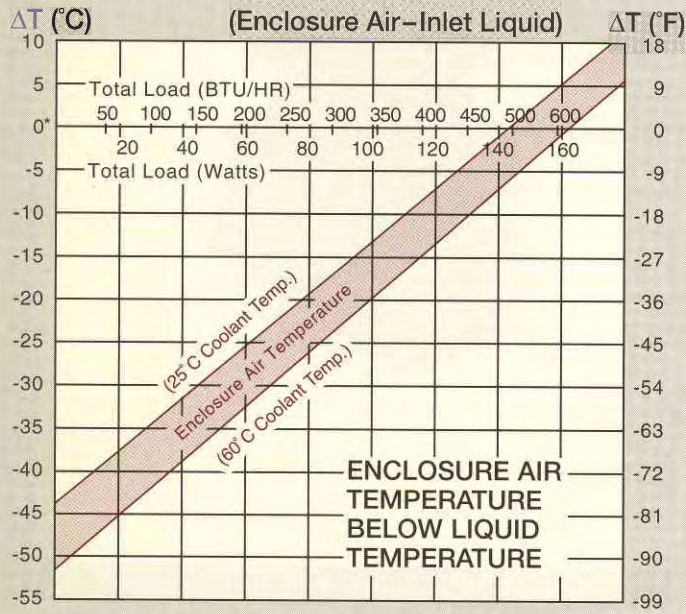
Teca's LHP-Series air conditioners are constructed with anodized aluminum liquid jackets with stainless steel fittings. You provide a constant flow of liquid as a heat removal source. Combining these features with thermoelectric modules make the LHP-series capable of both high capacity and high temperature differentials. Model LHP-800FF is designed for 30 VDC input, while the LHP-810FF is designed for 130 VDC input.

SPECIFICATIONS:

Model Number	LHP-800FF	LHP-810FF
• Input Voltage	30 VDC	120 VDC
• Input Current	8.1-9 Amps	3.11-3.58 Amps
• Minimum Ambient	-30°C / -21°F	-30°C / -21°F
• Maximum Ambient	+80°C / + 176°F	+80°C / + 176°F
• Minimum Flow Rate	0.5 GPM (2 L/M)	0.5 GPM (2 L/M)
• Enclosure Rating	Nema-12	Nema-12
• Weight	7 lbs. / 3.2 Kg.	7 lbs. / 3.2 Kg.
• Thermostat	Optional	Optional
• Power Supply (Opt.)	PS400-30	PS-130

☎ Technical Support Toll Free (888) TECA USA or (888) 832-2872

Performance Curve: LHP-800FF



Equation of Line

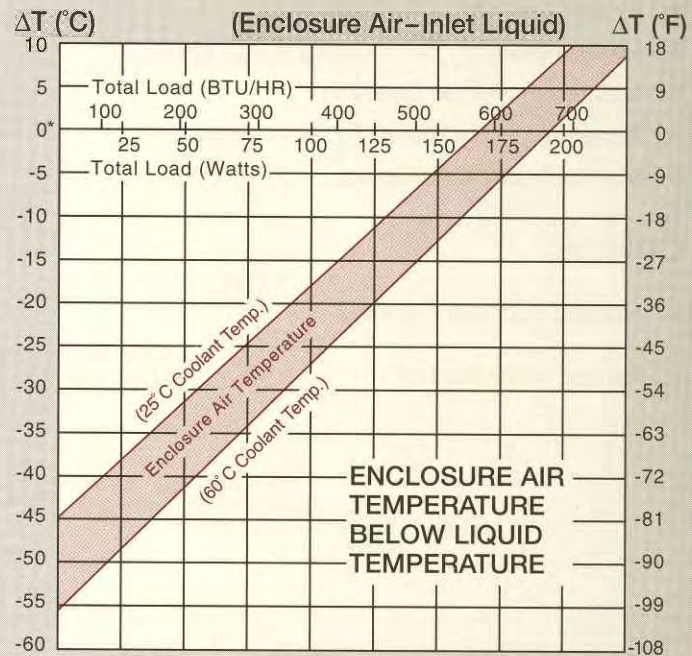
$y = \Delta T$ (°C)

$x = \text{Total Load (Watts)}$

Liquid Temp.	25°C	60°C
Enclosure	$y = .32x - 44.5$	$y = .32x - 52.0$

*Inlet Liquid Temp. Line

Performance Curve: LHP-810FF



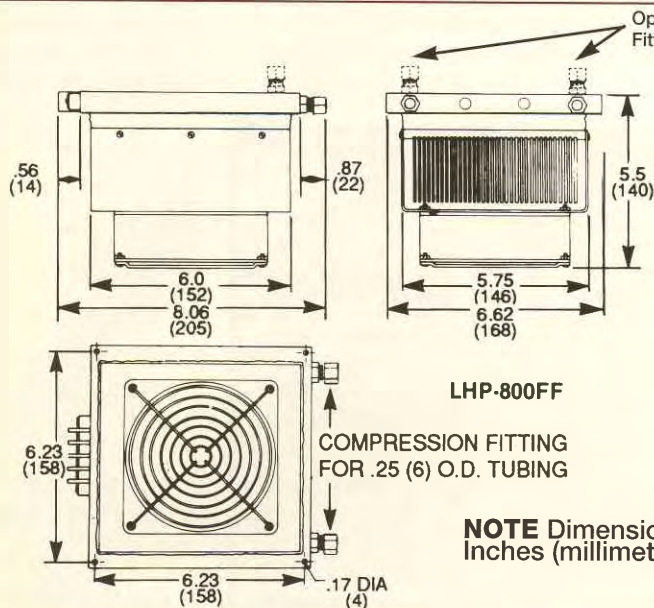
Equation of Line

$y = \Delta T$ (°C)

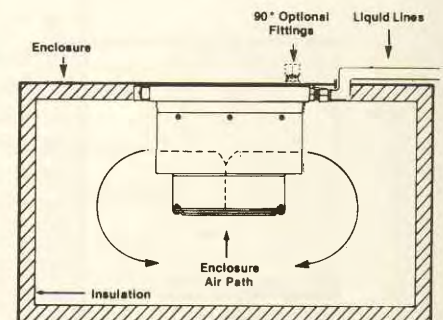
$x = \text{Total Load (Watts)}$

Liquid Temp.	25°C	60°C
Enclosure	$y = .28x - 45$	$y = .295x - 56$

*Inlet Liquid Temp. Line



Typical Mounting Method



LHP-300FF

Solid-State Air Conditioner, Liquid Cooled

Air Rating 290-325 Btu/Hr
(Liquid Inlet to Cold Side Air)

Fin Rating 200-240 Btu/Hr
(Liquid Inlet to Cold Side Fin)

Features:

- Compact, only (5.43" L x 4" W x 4.5" D)
- Ambient Range, -30°C to +80°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation
- Adaptable to Explosion-Proof Applications
- Mounts in any Orientation

Options:

- Heating (Consult Factory)
- Temperature Control



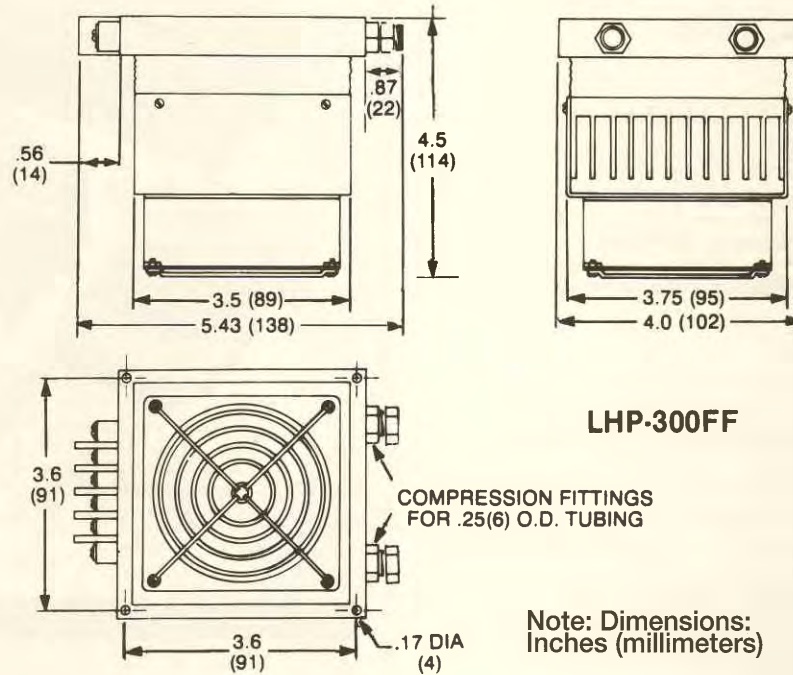
Applications in Pulp and Paper Mills, Machine Tools, & Electronics

Teca's LHP-Series air conditioners are constructed with anodized aluminum liquid jackets with stainless steel fittings. You provide a constant flow of liquid as a heat removal source. Combining these features with thermoelectric modules make the LHP-series capable of both high capacity and high temperature differentials. Model LHP-300FF is designed for 24 VDC input for the Thermoelectric modules and 115 VAC input for the fan. A DC power supply is available, model PS160-24.

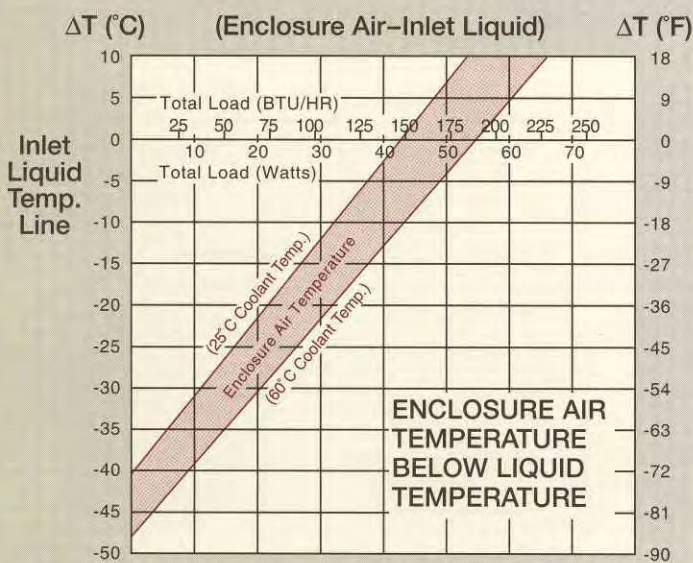
SPECIFICATIONS:

Model Number	LHP-300FF
• Input Voltage	24 VDC (T.E.), 115 VAC (Fan)
• Input Current	4.5 Amps (T.E.)
• Minimum Ambient	-30°C / -21°F
• Maximum Ambient	+80°C / + 176°F
• Minimum Flow Rate	0.1 GPM (.4 L/M)
• Enclosure Rating	Nema-12
• Weight	2.75 lbs. / 1.25 Kg.
• Thermostat	Optional
• Power Supply (Opt.)	PS160-24

☎ Technical Support Toll Free (888) TECA USA or (888) 832-2872



Performance Curve: LHP-300FF

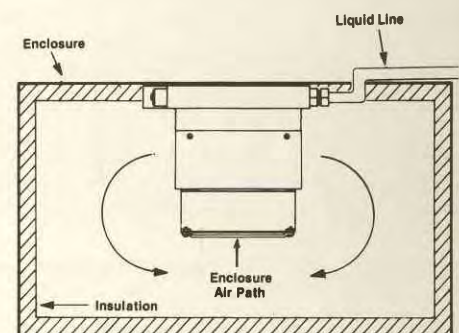


Please Note: Performance curves relative to flow rate of 0.6 L/Min

Equation of Line
 $y = \Delta T (^{\circ}\text{C})$
 $x = \text{Total Load (Watts)}$

Liquid Temp.	25°C	60°C
Enclosure	$y = .59x - 35.5$	$y = .59x - 41.5$
Cold Sink	$y = .51x - 43.0$	$y = .52x - 49.0$

Typical Mounting Method

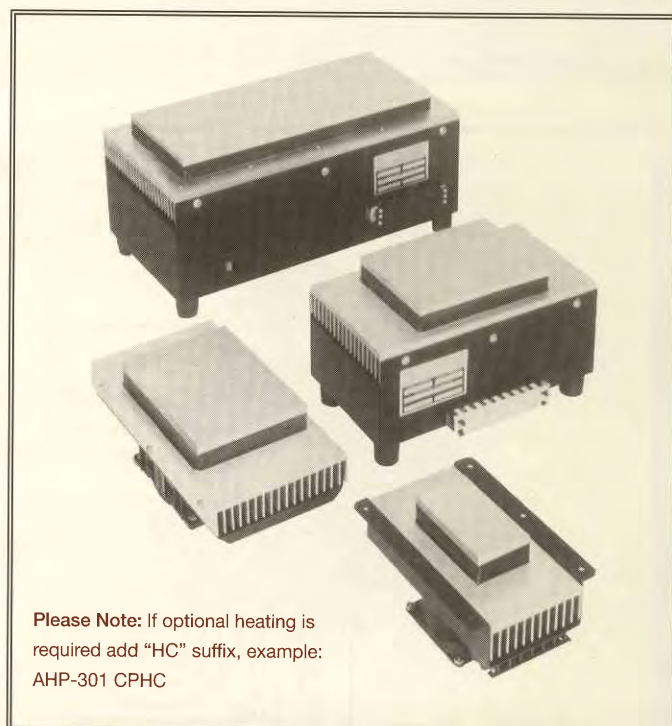


Features:

- No Load Cooling to -20°C, at room temperature of 25°C
- Bench-top Models available
- AC & DC Input Models
- Ambient Range, -10°C to +70°C
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation

Options:

- Heat/Cool Models
- DC Power Supplies
- Temperature Control



Applications in Instrumentation, Laboratory and Component Cooling

TECA's smallest air cooled cold plate, model AHP-150CP, comes with a standard 12 or 24 VDC input. Higher capacity is achieved with the AHP-1200CP, delivering up to 160 Watts of cooling from a standard AC input. Precise temperature control is available with our digital temperature controllers, models 3200 or 965.

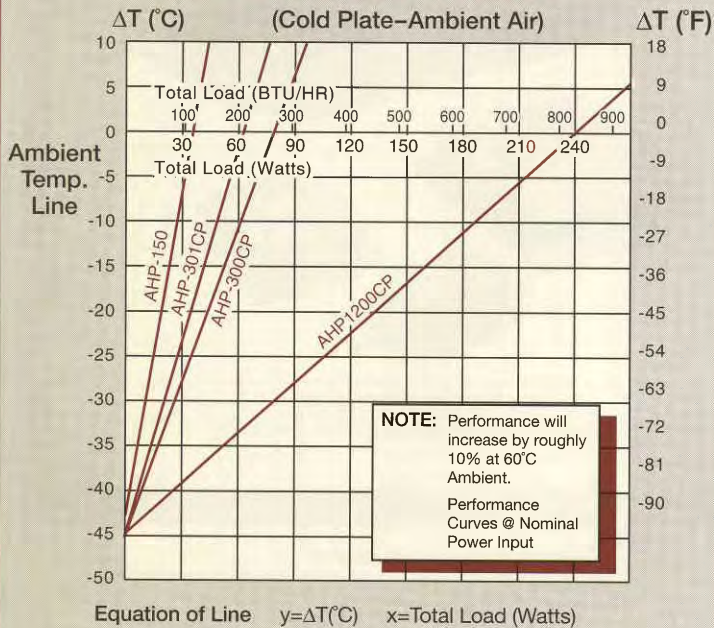
SPECIFICATIONS:

Model Number	Capacity Btu/Hr (Watts)	Input Voltage (Volts)	Input Current (Amps)	Heating (Optional) Btu/Hr (Watts)	Weight Lbs. (Kg)
AHP-150CP	125 (37)	12*/24 VDC	6/3	245 (72) 24 VDC Input	3.5 (1.6)
AHP-300CP	265 (78)	12/24*/48 VDC	12.5/5.3/3.1	245 (72) 24 VDC Input	6.0 (2.7)
AHP-301CP	225 (66)	115*/230 VAC	1.1/0.5	340 (100)	10.5 (4.8)
AHP-1200CP	560 (164)	115VAC	3	680 (200)	25.7 (11.7)

* Standard Factory Wiring (Terminal jumpers are provided for alternate voltages)

 Toll Free (888) TECA USA (832-2872)

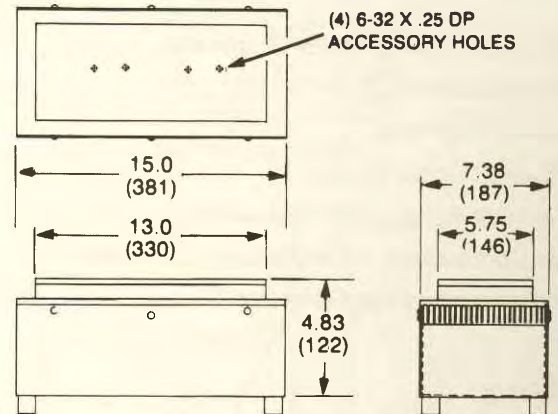
Performance Curve: AHP-150/AHP-300CP/ AHP-301CP/AHP-1200CP



COLD PLATE PERFORMANCE @ 25°C AMBIENT TEMPERATURE

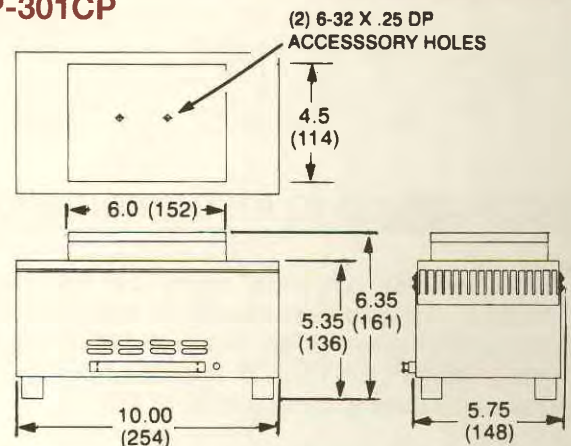
MODEL	AHP-150	AHP-300CP	AHP-301CP	AHP-1200CP
EQUATION	$y = 1.2x - 44.0$	$y = .60x - 46.4$	$y = .69x - 45.2$	$y = .19x - 45.0$

AHP-1200CP



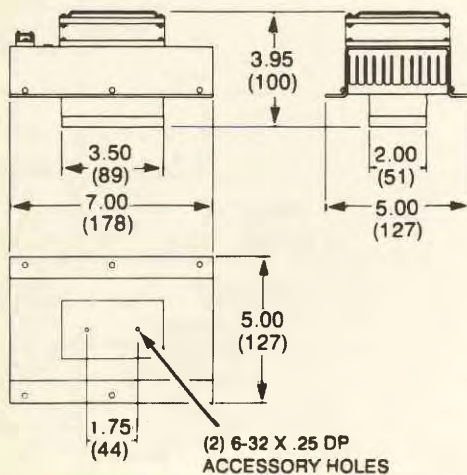
NOTE: 10-32 X 3/4 STUDS AND GASKET NOT SHOWN

AHP-301CP

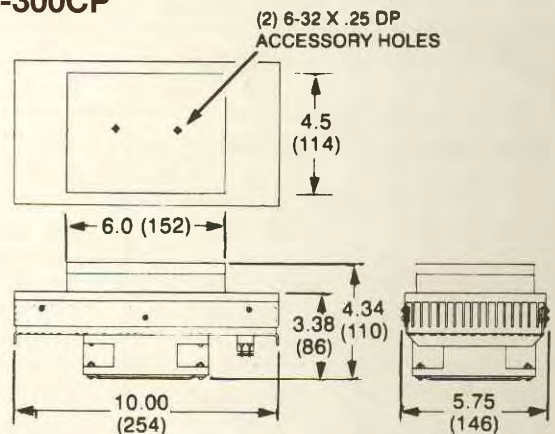


NOTE: 10-32 X 3/4 STUDS AND GASKET NOT SHOWN

AHP-150CP



AHP-300CP



NOTE: 10-32 X 3/4 STUDS AND GASKET NOT SHOWN

Dimensions: Inches (millimeters)

AHP- Series

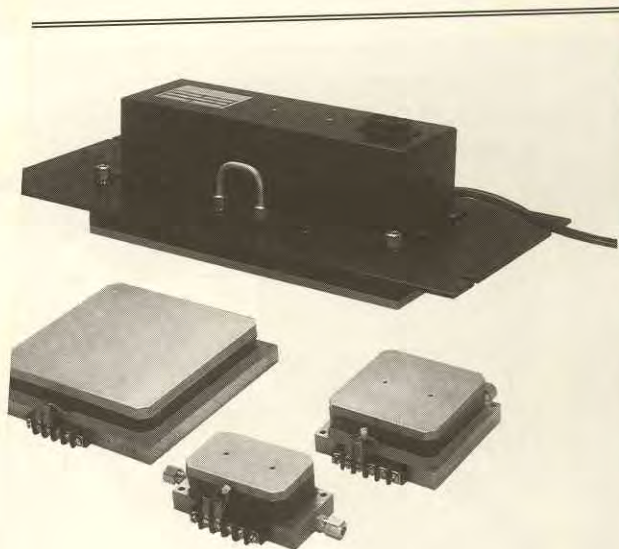
Features:

- No Load Cooling to -20°C , at room temperature of 25°C
- Bench-top Models available
- AC & DC Input Models
- Ambient Range
- No Compressor
- Maintenance Free

(4) 6-32 X .25 DP
ACCESSORY HOLES

(773) 342-4900

Plate Cold Plates, Liquid Cooled



Base Note: If heating is required add "HC" suffix, example:
P-800CPHC

Applications in Instrumentation, Laboratory and Component Cooling

TECA's smallest cold plate, model LHP-150, comes with a standard 12 input. It combines the use of thermoelectric cooling and liquid heat transfer to maximize the performance and efficiency. Greater C.O.P.'s can be achieved by operating at lower power levels. The LHP-1700CP is our largest liquid cooled cold plate designed to operate direct from 115 VAC input, model LHP-1702CP operates from 230 VAC input. Precise temperature control is available with our digital temperature controllers, models 3200 or 965.

SPECIFICATIONS:

Model Number	Capacity Btu/Hr (Watts)	Input	Min. Flow Required	Heating (Optional) Btu/Hr (Watts)	Weight Lbs. (Kg)
LHP-150CP	135 (40)	12 VDC 4.5 Amps	.05 GPM	123 (36) 12 VDC Input	.75 (.34)
LHP-300CP	300 (88)	24 VDC 4.5 Amps	.05 GPM	246 (72) 24 VDC Input	1.75 (.80)
LHP-800CP	750 (220)	30 VDC 10 Amps	0.5 GPM	680 (200) 115 VAC Input	5.2 (2.4)
LHP-1700CP	1500 (450)	115 VAC 6 Amps	0.5 GPM	1360 (400) 115 VAC Input	19.75 (9.0)
LHP-1702CP	1500 (450)	230 VAC 4.5 Amps	0.5 GPM	1360 (400) 230 VAC Input	19.75 (9.0)

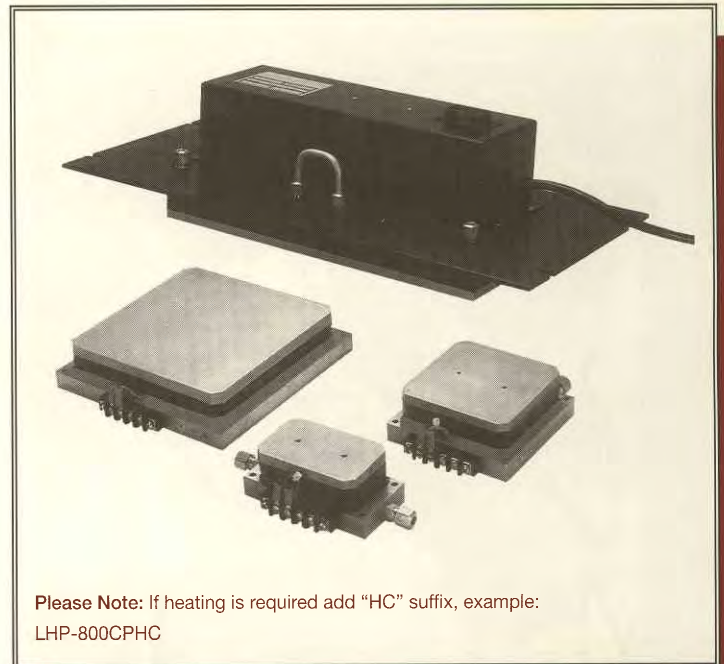
Toll Free (888) TECA USA (832-2872)

Features:

- No Load Cooling to -25°C , at room temperature of 25°C
- No Moving Parts
- AC & DC Input Models
- Ambient Range, -30°C to $+80^{\circ}\text{C}$
- No Compressor, Fluorocarbons, or Filters
- Maintenance-Free Operation

Options:

- Heat/Cool Models
- DC Power Supplies
- Temperature Control



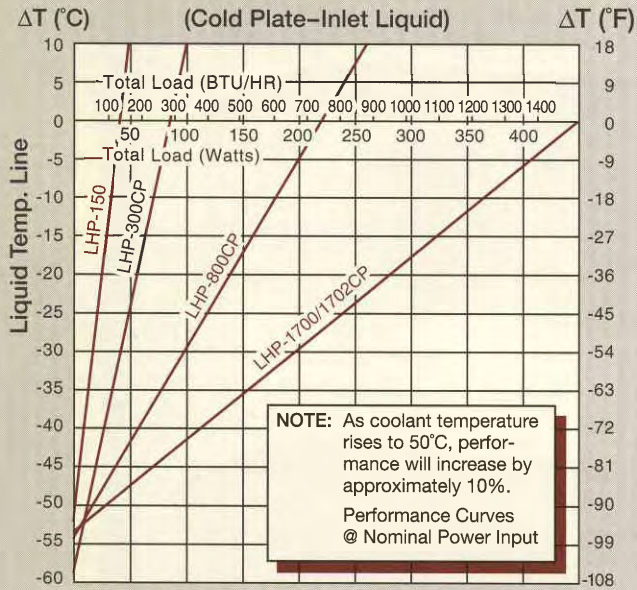
Applications in Instrumentation, Laboratory and Component Cooling

Teca's smallest cold plate, model LHP-150, comes with a standard 12 input. It combines the use of thermoelectric cooling and liquid heat transfer to maximize the performance and efficiency. Greater C.O.P.'s can be achieved by operating at lower power levels. The LHP-1700CP is our largest liquid cooled cold plate designed to operate direct from 115 VAC input, model LHP-1702CP operates from 230 VAC input. Precise temperature control is available with our digital temperature controllers, models 3200 or 965.

SPECIFICATIONS:

Model Number	Capacity Btu/Hr (Watts)	Input	Min. Flow Required	Heating (Optional) Btu/Hr (Watts)	Weight Lbs. (Kg)
LHP-150CP	135 (40)	12 VDC 4.5 Amps	.05 GPM	123 (36) 12 VDC Input	.75 (.34)
LHP-300CP	300 (88)	24 VDC 4.5 Amps	.05 GPM	246 (72) 24 VDC Input	1.75 (.80)
LHP-800CP	750 (220)	30 VDC 10 Amps	0.5 GPM	680 (200) 115 VAC Input	5.2 (2.4)
LHP-1700CP	1500 (450)	115 VAC 6 Amps	0.5 GPM	1360 (400) 115 VAC Input	19.75 (9.0)
LHP-1702CP	1500 (450)	230 VAC 4.5 Amps	0.5 GPM	1360 (400) 230 VAC Input	19.75 (9.0)

Performance Curves: LHP-150/LHP-300CP/ LHP-800CP/LHP-1700CP/LHP-1702CP

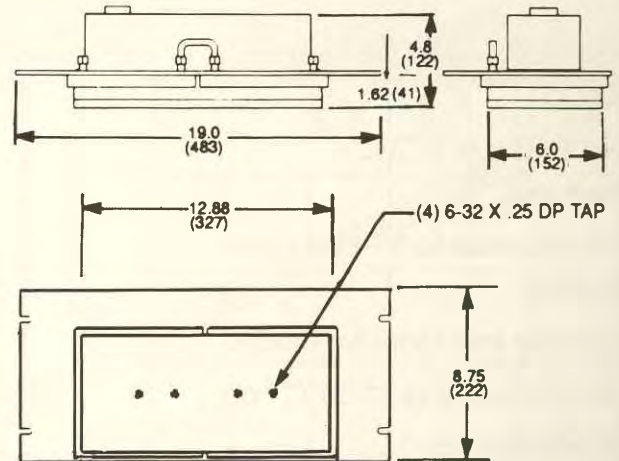


COLD PLATE PERFORMANCE @ 25°C LIQUID TEMPERATURE

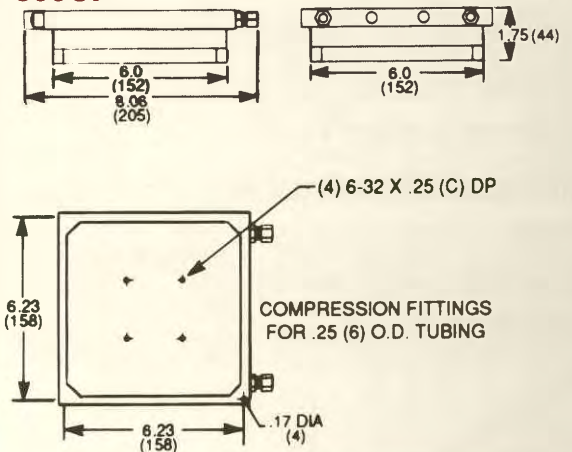
MODEL	LHP-150	LHP-300CP	LHP-800CP	LHP-1700CP/LHP1702CP
EQUATION	$y = 1.31x - 52.0$	$y = .66x - 58.0$	$y = .25x - 54.0$	$y = .12x - 54.0$

Equation of Line: $y = \Delta T$ (°C), $x = \text{Total Load (Watts)}$

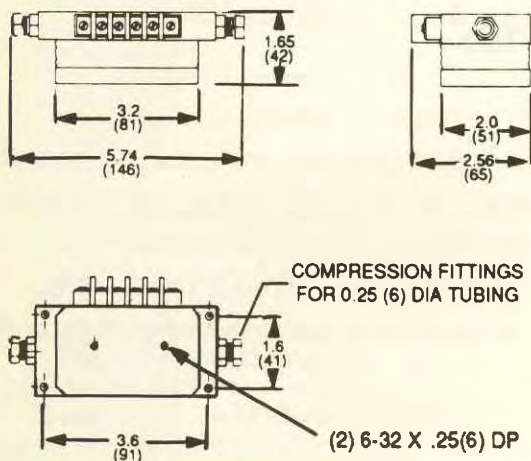
LHP-1700CP/LHP-1702CP



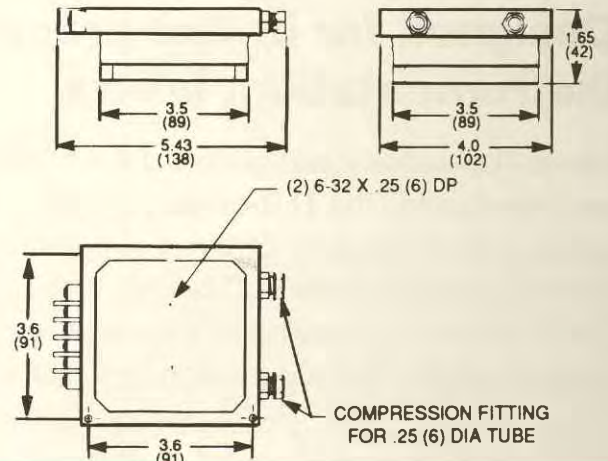
LHP-800CP



LHP-150



LHP-300CP

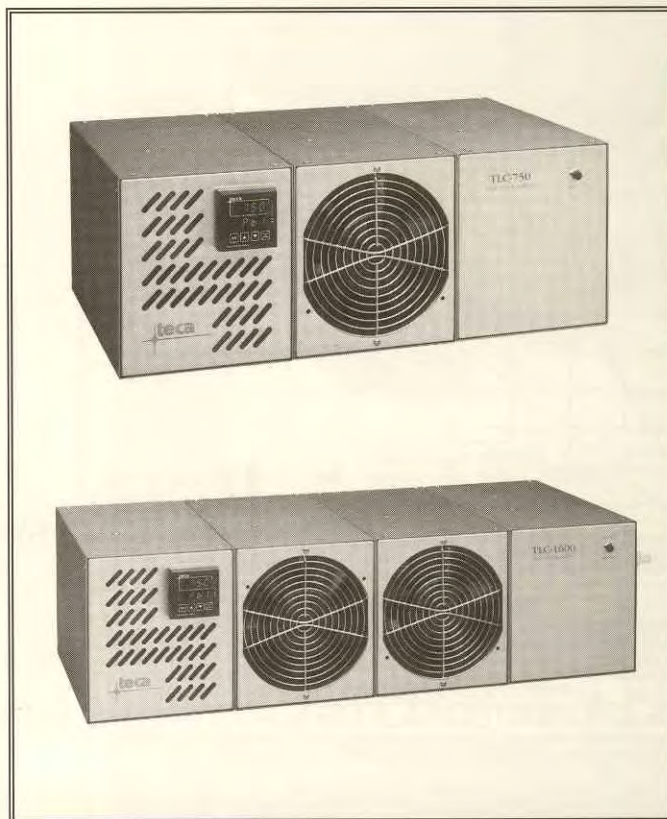


Dimensions: Inches (millimeters)

COMPLETE SYSTEM — RATING: 600-1400 BTU/h

Features:

- High Efficiency/ Compact Design
- No CFC's or HCFC's Required
- Thermoelectric (Peltier) Style Cooling
- Durable and Modular Design
- No load cooling 21-37°C from ambient
- TLC-750 (600-675 BTU/h)
- TLC-1600 (1350-1550 BTU/h)
- Optional Low Noise Version
- Optional Heating
- Attractive Anodize Finish
- One Pass Airflow (Front to Back)
- Quick Coupling, Shut Off Valve Fittings



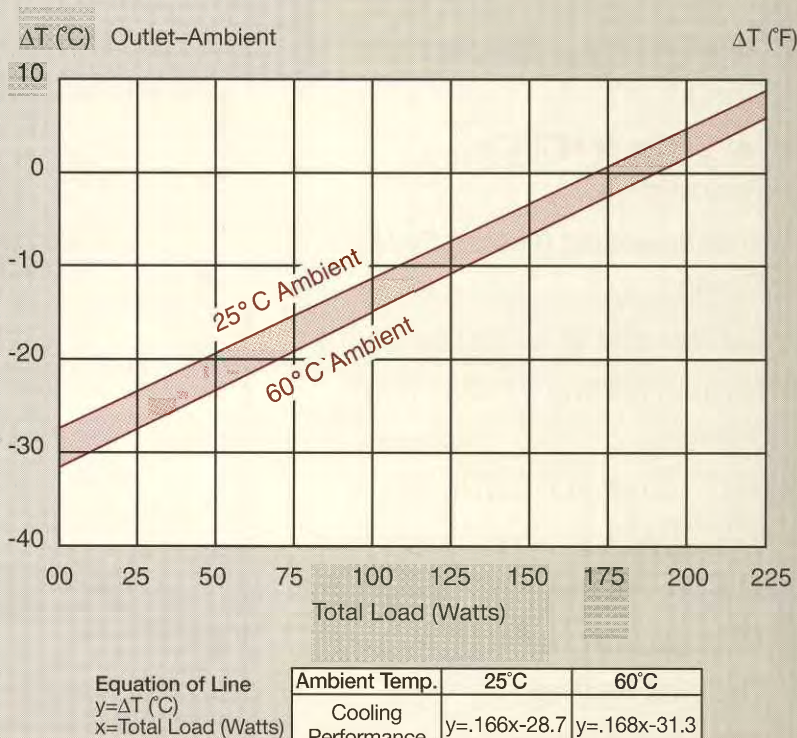
Designed for in-line process cooling, instrumentation, lasers

Teca's TLC-series liquid chillers differ from the ALC-series in that they are designed as complete packaged units. The TLC-series includes a seal-less magnetic drive pump and a 1 liter reservoir with low level indicator. Optional temperature control (Model 965 or 3200), can be offered as an integral package to the TLC-series. With today's growing concerns about the adverse effect that CFC's (chloro-fluorocarbons) have on the environment, thermoelectric cooling technology is an environmentally friendly solution to tomorrow's problems.

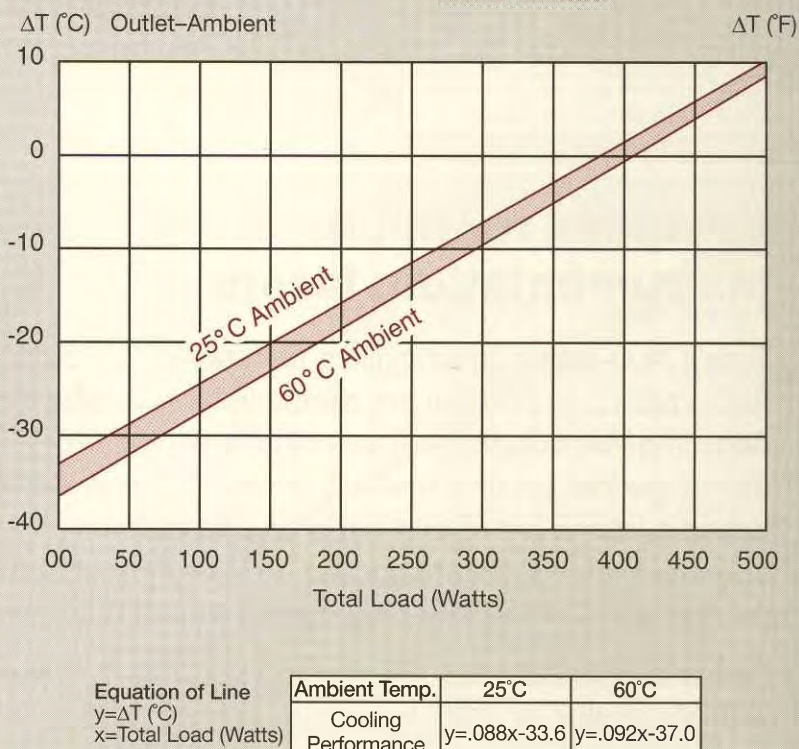
Specifications:

MODELS	TLC-750	TLC-1600
CAPACITY		
Cooling (Btu/Hr) (Watts)	600-635 175-200	1350-1400 375-400
Heating (Optional)		
INPUT		
Voltage	115 VAC	115 VAC
Current–RMS (35°C)	3.9 Amps AC	5.3 Amps AC
Current–RMS (50°C)	3.6 Amps AC	5.1 Amps AC
Frequency (Hz)	50/60	50/60
TEMPERATURE CONTROL		
Digital (Opt.)	3200 (Cool only)	
See Pgs. 42,43	965 (Heat/Cool)	
FLUID		
Max Liquid Temp. (°C/°F)	55/130	55/130
Max Ambient Temp. (°C/°F)	70/158	70/158
Liquid Jacket Material: Aluminum Pump Material: Polypropylene, Ceramic, Viton, 316 Stainless Steel		
RESERVOIR		
Capacity (Ltr/Gal.)	1/4.5	1/4.5
Pressure Relief (PSI)	25	25
FAN		
Number of Fans	1	2
DB (Noise Rating) Single Fan, Not in System	47/49 PSIL	47/49 PSIL
Optional Quiet Fans: Consult Factory		
DIMENSIONS/WEIGHT		
Height in. (cm)	7 (17.8)	7 (17.8)
Width in. (cm)	18.75 (47.63)	25 (63.5)
Depth in. (cm)	10.12 (25.70)	10.12 (25.70)
KG (LBS)	16.8 (37)	23.4 (51.5)

Performance: TLC-750



Performance: TLC-1600



ALC-750

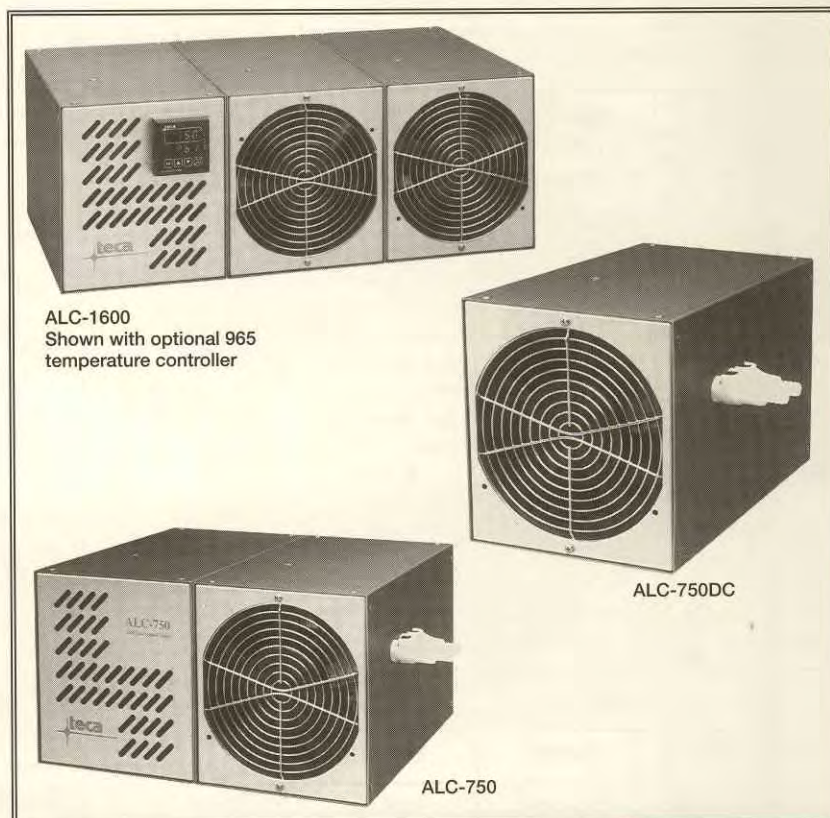
ALC-750DC/ALC-1600

Solid State Liquid Chillers

SUB-SYSTEM — RATING: 600-1700 BTU/h

Features:

- High Efficiency/Compact Design
- No CFC's or HCFC's Required
- Thermoelectric (Peltier) Style Cooling
- Durable and Modular Design
- No load cooling 22-45°C from ambient
- ALC-750 or ALC750DC (600-800 BTU/h)
- ALC-1600 (1500-1700 BTU/h)
- Optional Low Noise Versions
- Optional Heating
- Attractive Anodize Finish



Designed for in-line process cooling, instrumentation, lasers

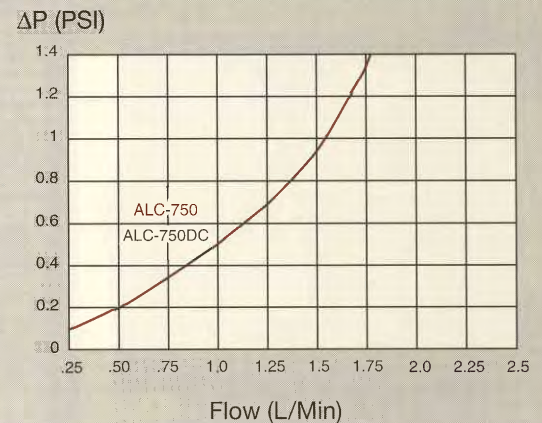
Teca's ALC-series liquid chillers feature high capacity in a compact design. Models (ALC-750, ALC-750DC, ALC-1600) are designed to maximize liquid cooling without the use of ozone depleting fluorocarbons. A combination of thermoelectric cooling modules and an efficient heat exchanger design give the ALC-series chillers the edge in liquid cooling. Traditional conventional based systems are usually expensive to maintain, bulky, hard to control, and inconvenient to operate. With solid-state cooling, temperature control within one degree along with maintenance-free operation are just some of the benefits that will be experienced.

Power supplies are included for models ALC-750 and ALC-1600. Model ALC-750DC is offered with a standard 24 VDC input.

Specifications:

MODELS	ALC-750	ALC-750DC	ALC-1600
CAPACITY			
Cooling (Btu/h) (Watts)	715-785 210-230	785-850 230-250	1535-1700 450-500
Heating (Consult Factory)			
INPUT			
Voltage	115 VAC	24 VDC	115 VAC
Current-RMS (30°C)	3.5 Amps	17.5 Amps	7.7 Amps
Current-RMS (50°C)	3.2 Amps	16.5 Amps	6.9 Amps
Frequency (Hz)	50/60	n/a	50/60
TEMPERATURE CONTROL			
Digital (Opt.) See Pgs. 42,43	965 3200	965DC 3200DC	965 3200
FLUID			
Max Liquid Temp.	80°C/176°F		
Max Ambient Temp.	70°C/158°F		
Liquid Jacket Material: Aluminum			
FAN			
Number of Fans	1 Fan	1 Fan	2 Fans
DB (Noise Rating) Single Fan, Not in System	47/49 PSIL		
Optional Quiet Fans: Consult Factory			
DIMENSIONS/WEIGHT			
Height in. (cm)	7.03 (17.9)	7.03 (17.9)	7 (17.8)
Width in. (cm)	12.62 (32.1)	6.31 (16.0)	18.75 (47.63)
Depth in. (cm)	10.12 (25.7)	10.12 (25.7)	10.12 (25.70)
KG (LBS)	12.3 (27)	6.6 (14.5)	18.9 (41.5)

Pressure vs. Flow



Performance ALC-750/ ALC-750DC



Equation of Line
y=ΔT (°C)
x=Total Load (Watts)

MODEL	30°C Ambient	50°C Ambient
ALC-750	y=.193x-40.4	y=.189x-43.3
ALC-750DC	y=.202x-45.8	y=.195x-48.4

Performance ALC-1600



Equation of Line
y=ΔT (°C)
x=Total Load (Watts)

30°C Ambient	50°C Ambient
y=.076x-34.3	y=.072x-36.4

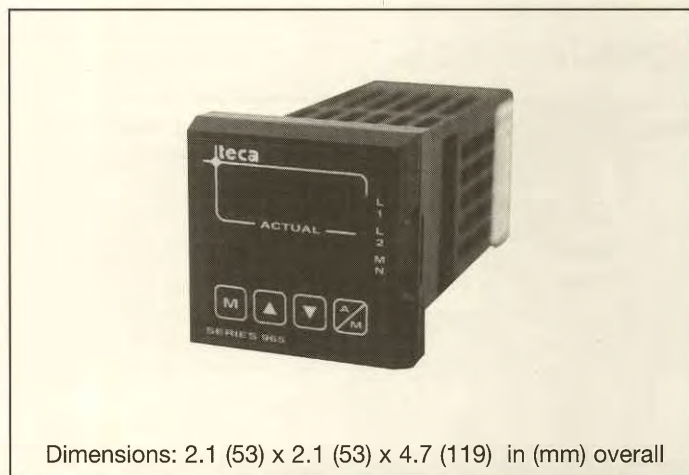
Temperature Controls Models: 965, 3200, TC-6F, TC-3F

Model: 965



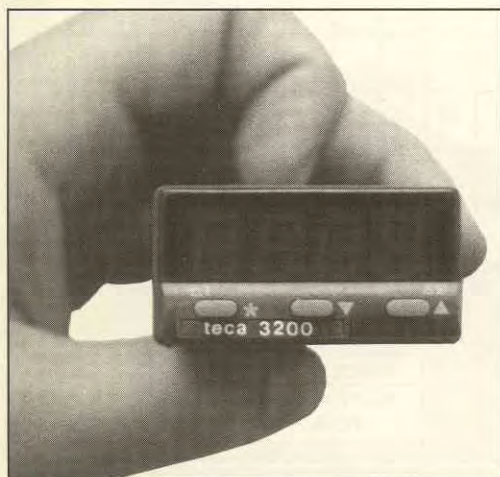
Features:

- 1/16 DIN
- Cool/Heat
- Dual Display
- Single Set Point



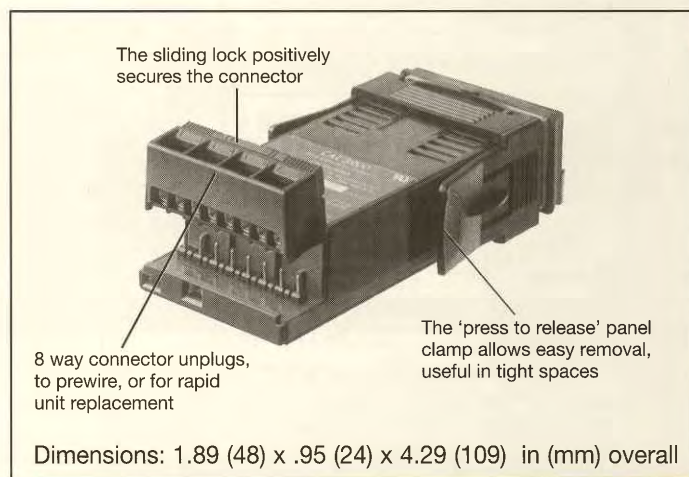
Dimensions: 2.1 (53) x 2.1 (53) x 4.7 (119) in (mm) overall

Model: 3200



Features:

- 1/32 DIN
- Cool Only
- Single Display
- Single Set Point



Dimensions: 1.89 (48) x .95 (24) x 4.29 (109) in (mm) overall

Models 965 and 3200 are digital microprocessor based temperature controllers designed to be used in conjunction with T.E.C.A. heat pumps. When ordered as a complete package, simply plug the unit into the heat pump with the supplied connector.

Both models are designed with a NEMA 4X front panel for corrosion and water resistance. This is ideal for applications such as food processing and food packaging, where equipment needs to be cleaned frequently. Features such as auto-tuning, dual output, and single input are available from these microprocessor based controllers. Each unit comes with factory default programming, but can be user modified through a setup menu.

Temperature Control Specifications

965
3200

FEATURES/OPTIONS

FRONT PANEL DISPLAY	DUAL	SINGLE
OPERATOR LOCKOUT	YES, 4 LEVEL	YES, 4 LEVEL
RAMPING TO SET POINT	YES	NO
MICROPROCESSOR BASED	YES	YES
TYPE	P.I.D.	P.I.D.
AUTO TUNING	Yes	Yes
DATA RETENTION	Yes	Yes
OPTIONAL DC INPUT	12/24	12/24

PHYSICAL

SIZE	1/16 DIN (2.1" x 2.1" x 4.7")	1/32 DIN (1.89" x .95" x 4.29")
WEIGHT	8 oz	3.5 oz

OPERATION

POWER INPUT	100-240 VAC	90-264 VAC
POWER CONSUMPTION	5VA	2.5 VA
SENSOR PROVIDED	T-type Thermocouple 6'	T-type Thermocouple 6'
OUTPUT 1	COOL	COOL
OUTPUT 2	HEAT or ALARM	
ACCURACY	+/- 0.1% Span +/- 1 LSD	+/- 0.25% Span +/- 1 LSD
AMBIENT RANGE	0-65°C	0-50°C

GENERAL

NEMA RATING	4X	4X
AGENCY RATING	UL/CSA	UL/CSA/VDE

TC-6F, TC-3F Fixed Point Thermostat Control

Model TC-6F (Cool Only) thermostat is designed using a magnetic reed sensing switch in conjunction with a solid state relay.

3 Adjustable set points are available with the following settings:

Position	Control Temperature	Tolerance	Reset Differential
1	35°C	+/- 5°C	10°C Maximum
2	25°C	+/- 5°C	10°C Maximum
3	Constant Cool		

See controller manual for switch location.

Model TC-3F (Heat/Cool) thermostat is designed with the following technology.

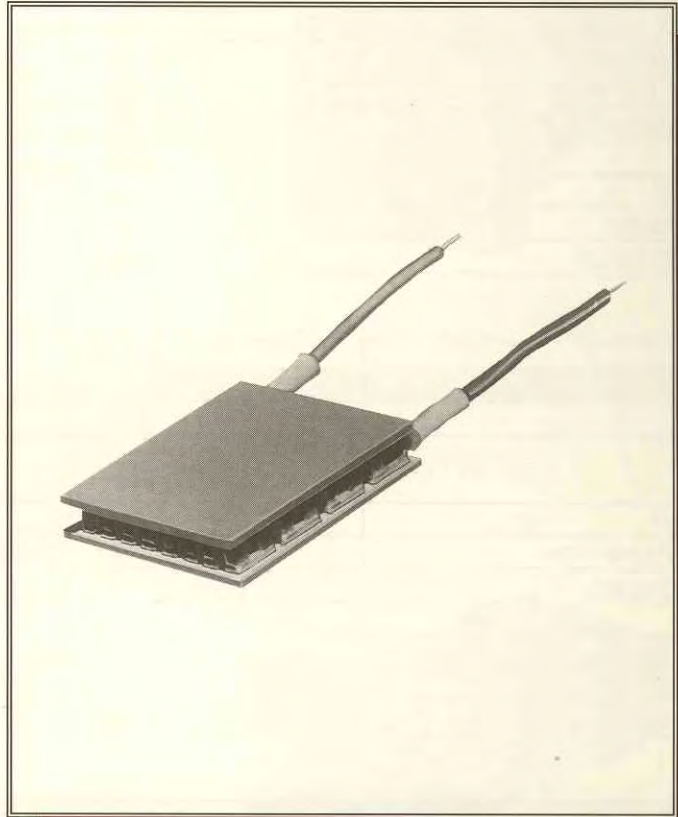
Mode	Control Temperature	Tolerance	Reset Differential
Cooling	35°C	+/- 5°C	10°C Maximum
Heating	10°C	+/- 5°C	10°C Maximum

Both models are designed for AC input and control. For DC input models, Consult Factory

Single Stage ThermoElectric Modules

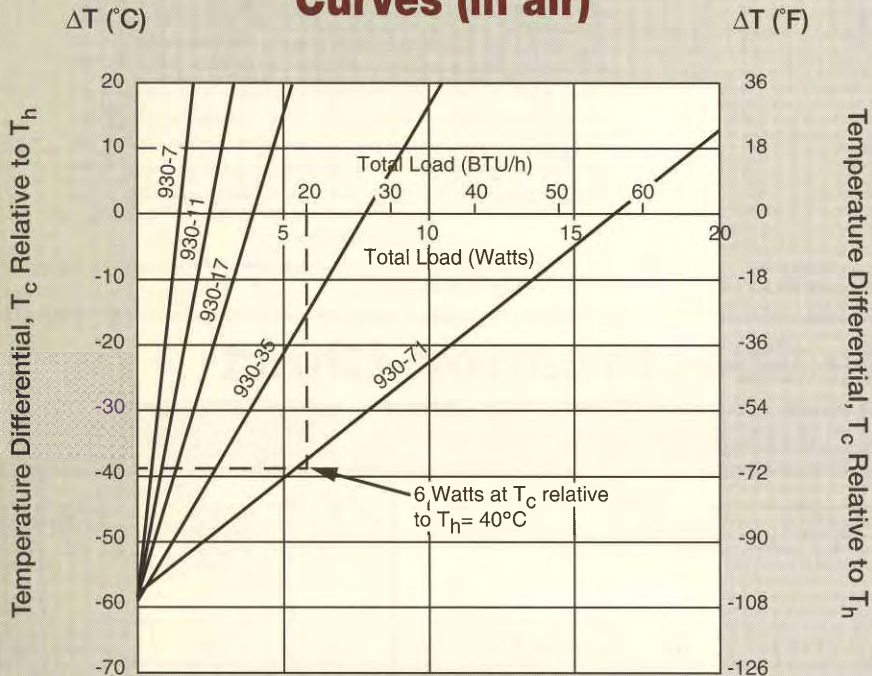
Features:

- Operates in -150°C (-238°F) to 80°C ($+176^{\circ}\text{F}$) Temperature Range
- No vibration, noise
- Operates in any orientation, horizontal, vertical, etc.
- Can operate in cooling or heating mode
- No moving parts, compressor, or piping required.
- No load cooling to -41°C (-42°F) With Hot side at $+25^{\circ}\text{C}$ ($+77^{\circ}\text{F}$)



Solid state thermoelectric modules are a silent, compact, and reliable method of heat removal. Applications ranging from missile guidance systems to portable refrigerators, are only limited by the imagination of the designer. System simplicity assures ease of adapting to thermoelectric heat pumping. Thermoelectrics have no compressor or piping, eliminating compressor maintenance and coolant leakage. Modules can be converted from cooling to heating by a reversal of polarity of the power input.

Series 930 Actual Performance Curves (in air)



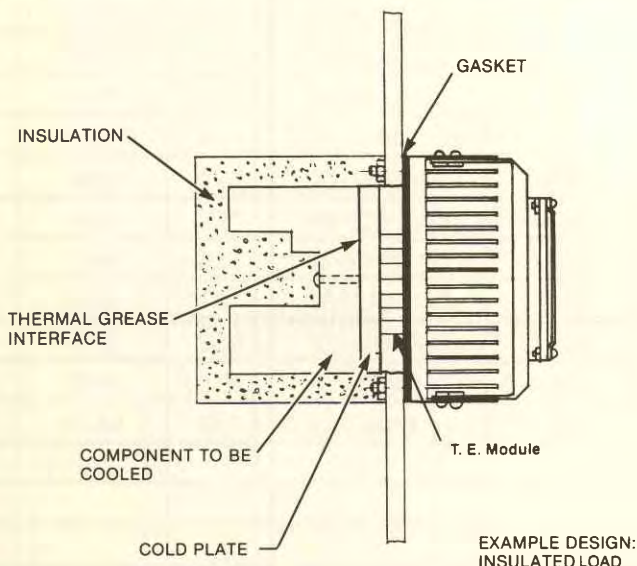
Temperature differentials are relative to 27°C (80°F hot side temperature T_h).
Note: As hot side temperature rises to 50°C (122°F temperature differential and load capacity will improve by approximately 10%. For improved efficiency and smaller heat sink dimensions the performance curves shown have been operated at 75% of the maximum rated current and voltage.

4 Easy Steps To Design Of ThermoElectrics

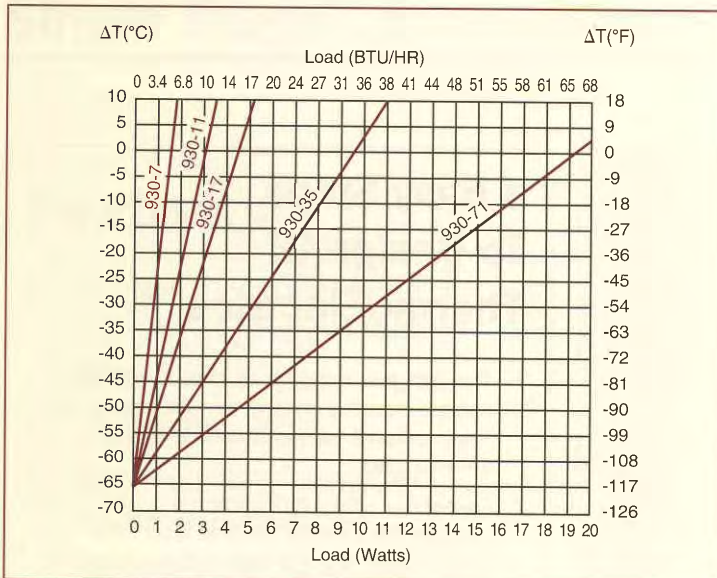
1. The designer must know three essential values; required cooling temperature of the load, ambient temperature and useful thermal load.
2. Determine actual requirements of TE module. Find the TE module cold side temperature (T_c), hot side temperature (T_h), and heat pumped by TE module (Q). Note that a temperature difference ($T_h - T_c$) in excess of 50°C generally requires a multi-stage design.
3. Select a TE module which operates in the current range you are willing to supply and supplies the heat pumping at the required temperature differential. (Single stage module specification chart, pg 46, 47)
4. With the module type, find module voltage and calculate electrical input power and hot side output to determine power supply and heat sink requirements.

Example

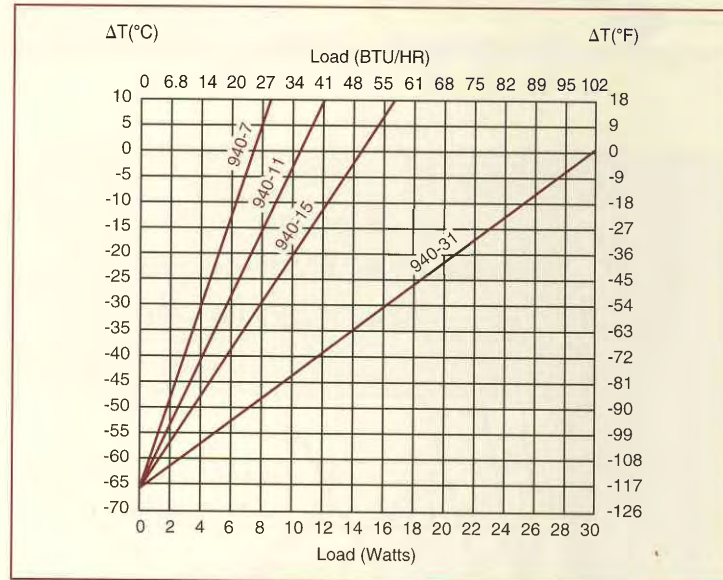
1. Assume the load temperature is $+5^\circ\text{C}$ ($+41^\circ\text{F}$) ambient air temperature is $+25^\circ\text{C}$ ($+77^\circ\text{F}$) and useful load is 4 watts (14 BTU/h).
2. In this practical case with well designed heat transfer and isolation, expect a 5°C temperature drop on the cold side to the load and a 15°C rise on the hot side to ambient with a forced convection heat exchanger. Leakage losses should not exceed 10% of the load. Thus, you have a 0°C ($+32^\circ\text{F}$) cold side, $+40^\circ\text{C}$ ($+104^\circ\text{F}$) hot side and 4.4 watt (15 BTU/h) module load.
3. A single stage 930-35 module operating at $T_h = 40^\circ\text{C}$ was found to provide 3.5 watts (12 BTU/h) of cooling. This unit is undersized. A 930-71 module operating at $T_h = 40^\circ\text{C}$ provides 6 watts (20 BTU/h) cooling. This module has ample capacity. (See curve on left.)
4. Module voltage is 6 volts, current is 2.8 amps. The heat load of the hot side heat exchanger is 4.4 watts, $+6 \text{ volts} \times 2.8 \text{ amps} = 21 \text{ watts}$.



930 Series



940 Series

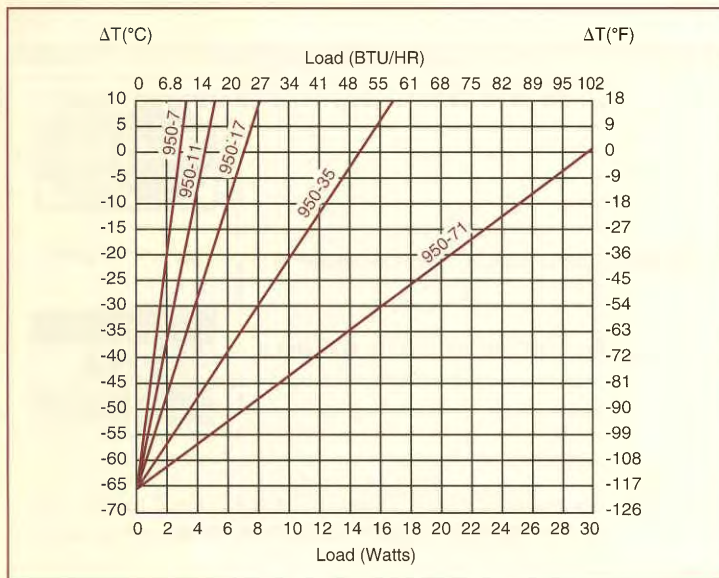


Temperature differentials relative to +27 $^{\circ}\text{C}$ (80 $^{\circ}\text{F}$) hot side temperature (T_h).

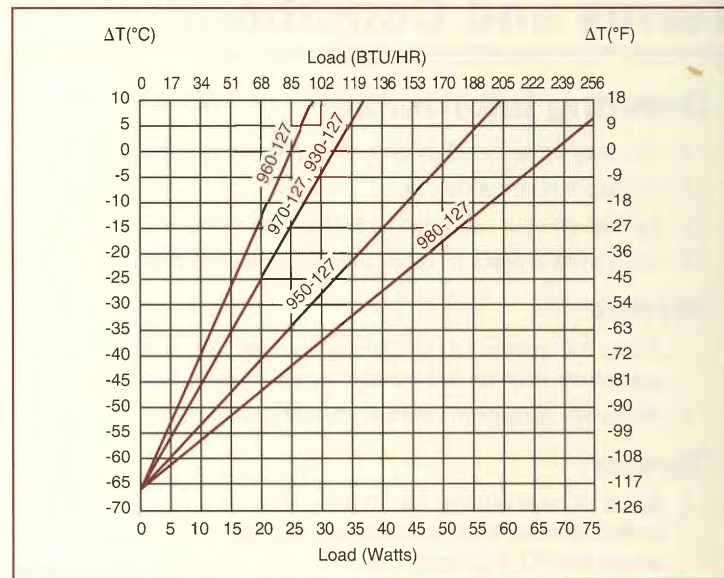
Single Stage Module Specification Chart

Module Series/ Couple	Performance								
	$T_h=27^{\circ}\text{C}$			$T_h=35^{\circ}\text{C}$			$T_h=50^{\circ}\text{C}$		
	Max ΔT @ $Q_c=0$ ($^{\circ}\text{C}$)	Max Q_c @ $\Delta T=0$ (Qc watts)	Equation of Line	Max ΔT @ $Q_c=0$ ($^{\circ}\text{C}$)	Max Q_c @ $\Delta T=0$ (Qc watts)	Equation of Line	Max ΔT @ $Q_c=0$ ($^{\circ}\text{C}$)	Max Q_c @ $\Delta T=0$ (Qc watts)	Equation of Line
930-7	66	1.8	$\Delta T=36.7Q_c-66$	73.6	1.9	$\Delta T=38.7Q_c-73.6$	78.1	2.0	$\Delta T=39.1Q_c-78.1$
930-11	66	2.9	$\Delta T=22.76Q_c-66$	73.6	3.1	$\Delta T=23.7Q_c-73.6$	78.1	3.2	$\Delta T=24.4Q_c-78.1$
930-17	66	4.5	$\Delta T=14.67Q_c-66$	73.6	4.7	$\Delta T=15.7Q_c-73.6$	78.1	5.0	$\Delta T=15.6Q_c-78.1$
930-35	66	9.4	$\Delta T=7.02Q_c-66$	73.6	9.9	$\Delta T=7.43Q_c-73.6$	78.1	10.4	$\Delta T=7.51Q_c-78.1$
930-71	66	19.0	$\Delta T=3.7Q_c-66$	73.6	20.0	$\Delta T=3.65Q_c-73.6$	78.1	21.0	$\Delta T=3.68Q_c-78.1$
940-7	66	6.8	$\Delta T=9.70Q_c-66$	70.0	7.0	$\Delta T=10Q_c-70$	75.4	7.5	$\Delta T=10.1Q_c-75.4$
940-11	66	10.6	$\Delta T=6.23Q_c-66$	70.0	11.0	$\Delta T=6.4Q_c-70$	75.4	11.7	$\Delta T=6.4Q_c-75.4$
940-15	66	14.5	$\Delta T=4.55Q_c-66$	70.0	15.0	$\Delta T=4.67Q_c-70$	75.4	16.0	$\Delta T=4.71Q_c-75.4$
940-31	66	30.0	$\Delta T=2.23Q_c-66$	70.0	31.0	$\Delta T=2.25Q_c-70$	75.4	33.0	$\Delta T=2.27Q_c-75.4$
950-7	66	3.0	$\Delta T=22Q_c-66$	70.0	3.1	$\Delta T=2.2Q_c-70$	75.0	3.3	$\Delta T=22.7Q_c-75.0$
950-11	66	4.6	$\Delta T=14.35Q_c-66$	70.0	4.8	$\Delta T=14.6Q_c-70$	75.0	5.1	$\Delta T=14.7Q_c-75.0$
950-17	66	7.2	$\Delta T=9.17Q_c-66$	70.0	7.4	$\Delta T=9.46Q_c-70$	75.0	7.9	$\Delta T=9.50Q_c-75.0$
950-35	66	14.8	$\Delta T=4.46Q_c-66$	70.0	15.3	$\Delta T=4.58Q_c-70$	75.0	16.3	$\Delta T=4.60Q_c-75.0$
950-71	66	30.0	$\Delta T=2.3Q_c-66$	70.0	31.0	$\Delta T=2.26Q_c-70$	75.0	33.0	$\Delta T=2.23Q_c-75.0$
930-127	70	33.4	$\Delta T=2.10Q_c-70$	75.0	38.1	$\Delta T=1.97Q_c-75$	80.0	38.6	$\Delta T=2.07Q_c-80.0$
950-127	66	51.4	$\Delta T=1.28Q_c-66$	71.0	54.4	$\Delta T=1.30Q_c-71$	74.4	60.0	$\Delta T=1.24Q_c-74.4$
960-127	66	26.0	$\Delta T=2.54Q_c-66$	75.0	29.4	$\Delta T=2.55Q_c-75$	80.0	30.0	$\Delta T=2.67Q_c-80.0$
970-127	66	33.4	$\Delta T=1.98Q_c-66$	75.0	37.8	$\Delta T=1.98Q_c-75$	80.0	38.6	$\Delta T=2.07Q_c-80.0$
980-127	65	68.8	$\Delta T=.94Q_c-65$	72.2	83.2	$\Delta T=.87Q_c-72.2$	77.2	84.9	$\Delta T=.91Q_c-77.2$

950 Series

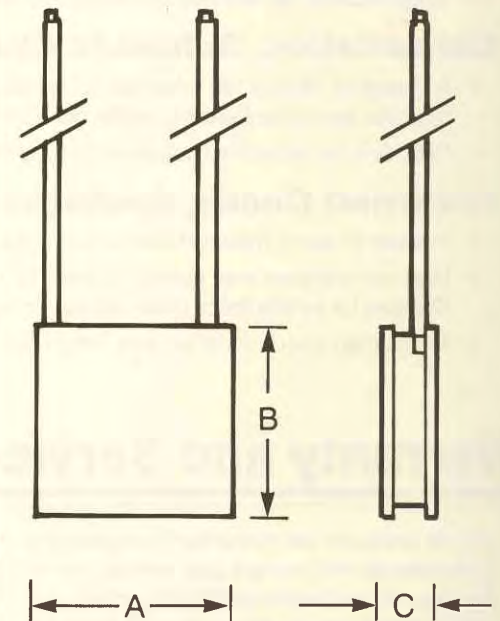


127 Couple Modules

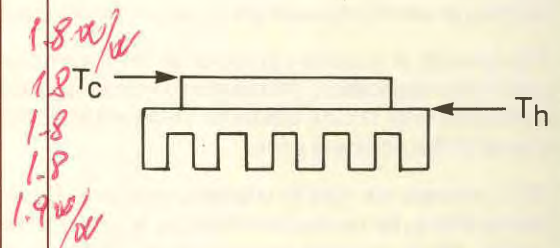


Temperature differentials relative to $+27^{\circ}\text{C}$ (80°F) hot side temperature (T_h).

Module Series/ Couple	Electrical			Dimensions		
	Max Current (amps)	Max DC Voltage (volts)	Nominal Resistance (Ω)	A in (cm)	B in (cm)	C in (cm)
930-7	3.7	0.8	0.22	0.38 (.965)	0.38 (.97)	0.19 (.48)
930-11	3.7	1.2	0.32	0.38 (.965)	0.57 (1.46)	0.19 (.48)
930-17	3.7	1.9	0.49	0.57 (1.46)	0.57 (1.46)	0.19 (.48)
930-35	3.7	3.9	0.93	0.57 (1.46)	1.20 (3.05)	0.19 (.48)
930-71	3.7	8.0	2.00	1.2 (3.05)	1.2 (3.05)	0.19 (.48)
940-7	14.0	0.8	0.06	0.57 (1.46)	0.57 (1.46)	0.18 (.45)
940-11	14.0	1.2	0.08	0.57 (1.46)	0.85 (2.16)	0.18 (.46)
940-15	14.0	1.7	0.11	0.57 (1.46)	1.20 (3.05)	0.18 (.46)
940-31	14.0	3.5	0.20	1.2 (3.05)	1.2 (3.05)	0.18 (.46)
950-7	6.0	0.8	0.15	0.38 (.97)	0.38 (.97)	0.15 (.38)
950-11	6.0	1.2	0.18	0.38 (.97)	0.57 (1.46)	0.15 (.38)
950-17	6.0	1.9	0.29	0.57 (1.46)	0.57 (1.46)	0.15 (.38)
950-35	6.0	3.9	0.61	0.57 (1.46)	1.20 (3.05)	0.15 (.38)
950-71	6.0	8.0	1.20	1.2 (3.05)	1.2 (3.05)	0.15 (.38)
930-127	3.9	15.4	3.24	1.57 (3.99)	1.57 (3.99)	0.185 (.47)
950-127	6.0	15.4	2.11	1.57 (3.99)	1.57 (3.99)	0.15 (.38)
960-127	3.0	15.4	4.08	1.18 (3.00)	1.18 (3.00)	0.142 (.38)
970-127	3.9	15.4	3.14	1.18 (3.00)	1.18 (3.00)	0.126 (.32)
980-127	8.5	15.4	1.49	1.57 (3.99)	1.57 (3.99)	0.130 (.33)



NOTE: For improved efficiency and smaller heat sink dimensions, operate T.E. modules at 75% of the maximum rated current and voltage.



For Equations:
Max ΔT = temperature differential ($T_c - T_h$) ($^{\circ}\text{C}$)
Max Q_c = heat pumped by module (watts)

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- You may order by telephone, during business hours, or
- By fax 24 hours a day, or
- By mail on your purchase order form or company letterhead.
- Orders are subject to acceptance, depending upon quantity, price, availability of parts and other considerations.

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- Prices are subject to change without notice.

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- Upon request, we will ship the same day on approved, in stock orders received before noon, Chicago time.

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