

The Practical Solar Heliostat System

Direct sunlight where you want it, when you want it.

We are proud to introduce the Practical Solar Heliostat System - the world's first computer-controlled heliostat system that's easily installed using only hand tools. We have combined rugged design with superior tracking technology & user-friendly software that runs on your PC. The software can control up to 200 heliostats – and each heliostat can have its own targets and timer settings.

Practical Solar heliostats use mirrors to reflect sunlight onto a fixed target. You can use one or more heliostats to reflect sunlight through windows and skylights for daylighting and direct space heating. Or you can use several heliostats for concentrating solar power (CSP) applications. On a clear day, each heliostat reflects 600 watts of heat and the visible equivalent of forty incandescent 100-watt light bulbs. If you use your heliostat system for thermal applications like space heating, you may qualify for a variety of federal and state tax credits and sales tax exemptions. You can find out more about these incentives at www.dsireusa.org.



Making solar practical

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System Features...

- Each heliostat can have multiple targets, meaning it can perform different tasks at different times or day or during different seasons. The user can change a heliostat's target at will, or use the software's timer function to change it automatically. New targets for any heliostat can be programmed in minutes.
- Practical Solar's Windows-based software is the ultimate method of precise sun-tracking. It is superior to sensor-based sun tracking in both reliability and affordability. Rotation of the heliostats is digitally controlled to an accuracy of 0.1 degrees, which translates to 5 inches over 100 feet.
- The user has the option of focusing the 8 individual mirrors in the heliostat mirror frame to customize the size and shape of the reflected sun spot. It is possible to achieve a 4X sun concentration per heliostat.

- Heliostats never need to be adjusted or updated. Each heliostat's position and calibration is permanently registered in the system.
- Mirrors will rarely - if ever - need to be cleaned in most locations.
- Heliostats are very stable in high winds; four struts form a pyramid of structural support behind the mirror frame.
- External parts are stainless steel and aluminum – all rust free and extremely durable.

- The cost of running the heliostats is minimal. A night light running all night consumes more power than 100 heliostats running all day. In fact, each heliostat delivers 3,000 times more power than it consumes.
- Installation is accomplished with household tools, so the cost of installation is low. Handy homeowners can install the system themselves.

Screen shot of software



Each heliostat reflects 600 watts of heat and the equivalent light of more than forty 100-watt incandescent light bulbs

What will you do with all that sunlight??

Natural Lighting

Natural light is not only more efficient, it is gentler to the human eye, reducing eye fatigue and headaches associated with fluorescent lighting. There are over 100 lumens per watt of sunlight. Thus natural lighting produces 3-7 times more visible light per watt of energy than electrical lighting systems.

Practical Solar heliostats can direct sunlight through windows, and down into skylights and atriums with the help of a secondary reflector. The mirrors on the heliostat can be focused during installation so the secondary reflector can be quite small (e.g. 2-foot diameter circle). The sun rays "crisscross" as they leave the secondary reflector and are gently dispersed downward through the skylight.

This technique provides an opportunity for building designers: a skylight can be small in size to minimize thermal losses through the glass, and at the same time, the skylight can receive as much light as a skylight many times its size. The result is that maximum energy comes in, while minimal energy goes out. Heliostats can also dramatically increase light input into natural lighting receivers and light tubes.

Health

Using heliostats during the winter months for natural lighting works as "light therapy" to offset Seasonal Affective Disorder (SAD, "winter depression"). While many therapeutic products available on the market simulate natural sunlight, Practical Solar heliostats deliver the real thing. Symptoms of Seasonal Affective Disorder include feelings of depression, sleeping too much, craving sweets, and having low energy.

Heat

Individual heliostats can be used for direct thermal applications, meaning that sunlight is applied directly to an area or object(s) to be heated, rather than going through a central collector or receiver. For example, heliostats can directly heat a swimming pool or supplement a building's heating system by directing sunlight through windows and skylights.



More sophisticated thermal applications distribute heat from a central receiver or collector ("CSP receiver"), which is the target of the heliostats' concentrated sunlight. Applications include hot water heating, air conditioning (with hot water-driven absorption chillers), thermal desalinization, hydrogen (H_2) production (for fuel cells), and low temperature industrial and agricultural applications (e.g. drying of wood, grain, leather)

Practical Solar plans to offer ancillary products like CSP receivers within the next year.

Electrical Power

Heliostats with thermal engines

Thermal engines convert heat to electrical power. Most thermal engines require extremely high temperature input, but organic Rankine cycle (ORC) microturbines and some Stirling engines can operate with inputted temperatures below 232°C (450°F) and are highly compatible for use with heliostats.

Heliostats with advanced solid-state technologies

Exciting new technologies are on the horizon that could be combined with heliostats to create a distributed generation system capable of delivering 5-50 kW of electrical power. Practical Solar continues to monitor companies around the world that are developing ever less expensive and more efficient concentrator cell technologies that directly convert concentrated solar energy to electricity.

Miscellaneous Applications

Here are some additional uses of heliostats suggested by our customers:

- Lighting windowless rooms (like medical and dental exam rooms) by using heliostats in conjunction with tube & mirror natural lighting systems.
- Illuminating museum & art exhibits
- Growing vegetables in wintertime or in shaded areas
- Drying paint or wood outdoors, or drying linens on a clothesline
- Drying shaded exterior walls to reduce mildew
- Sign illumination
- "Moonlighting" a patio or deck at night (software can be adapted for moon tracking)



Pricing

Control system

(software + driver box) = \$495

Each heliostat

(mirror frame + heliostat housing) = \$995

Please contact Practical Solar with your questions & orders: info@practicalsolar.com or (617)464-1770

HELIOSTAT SPECIFICATIONS

Reflector area	8 ft ² (0.74 m ²)
Weight	18 lbs (8 kg) <i>includes mirror frame, excludes reflectors</i>
Electrical interface	2-conductor cable, stranded & unshielded with overall jacket (see gauge guide in User Manual)
Electrical power consumption	<100 milliwatts (0.1 watts) average; < 1 watt-hour/day
Positioning accuracy	0.11 degrees
Rotational limit	+/- 60 degrees Azimuth; + 50/-5 degrees Altitude
Operating temperature range	-20°C to +50°C (-4°F to 122°F)
Operating humidity range	0-100% relative humidity
Maximum wind speed (operation)	80 kilometers / hour (≈ 50 MPH)
Maximum wind speed (structural)	150 kilometers / hour (≈ 90 MPH)

Feedback from Customers Using Heliostats for Natural Lighting

My heliostat has been performing flawlessly. The first "target" was an area that was very internal to my house and otherwise dark and cold. It is now bright and noticeably warmer both physically and psychologically. Also, the window the heliostat reflects through was usually quite cold to the touch. Now, it is warm and more comfortable to sit near.

Bill Stroud
Milton, MA

I think it's an understatement to say that having some more sunlight cheers your disposition. In our case, we spread the light across this panorama of windows, slightly above our heads. It makes a room – which is a pretty room – even more attractive, because we are splashed with sunlight for much of the day. We were able to do that with just one heliostat because we were able to adjust the position of the various smaller mirrors.

Victor Del Vecchio
Canton, MA

DRIVER BOX SPECIFICATIONS

Dimensions	8" x 4" x 2" (20.3 x 10.2 x 5.1 cm)
Weight	0.8 lbs (0.4 kg)
Input voltage	12 VDC (using 120-240 VAC, 47/63 Hz switching power supply, included)
Input power	0.25 watts / heliostat
Heliostats / array	200 maximum; higher power drivers on request
Operating temperature range	-20°C to +50°C (-4°F to 122°F)
Operating humidity range	0-99% humidity, non-condensing
Maximum distance from heliostat(s)	100 meters
Computer connection	RS-232C standard serial connection. USB-to-Serial Port adapter is included.

