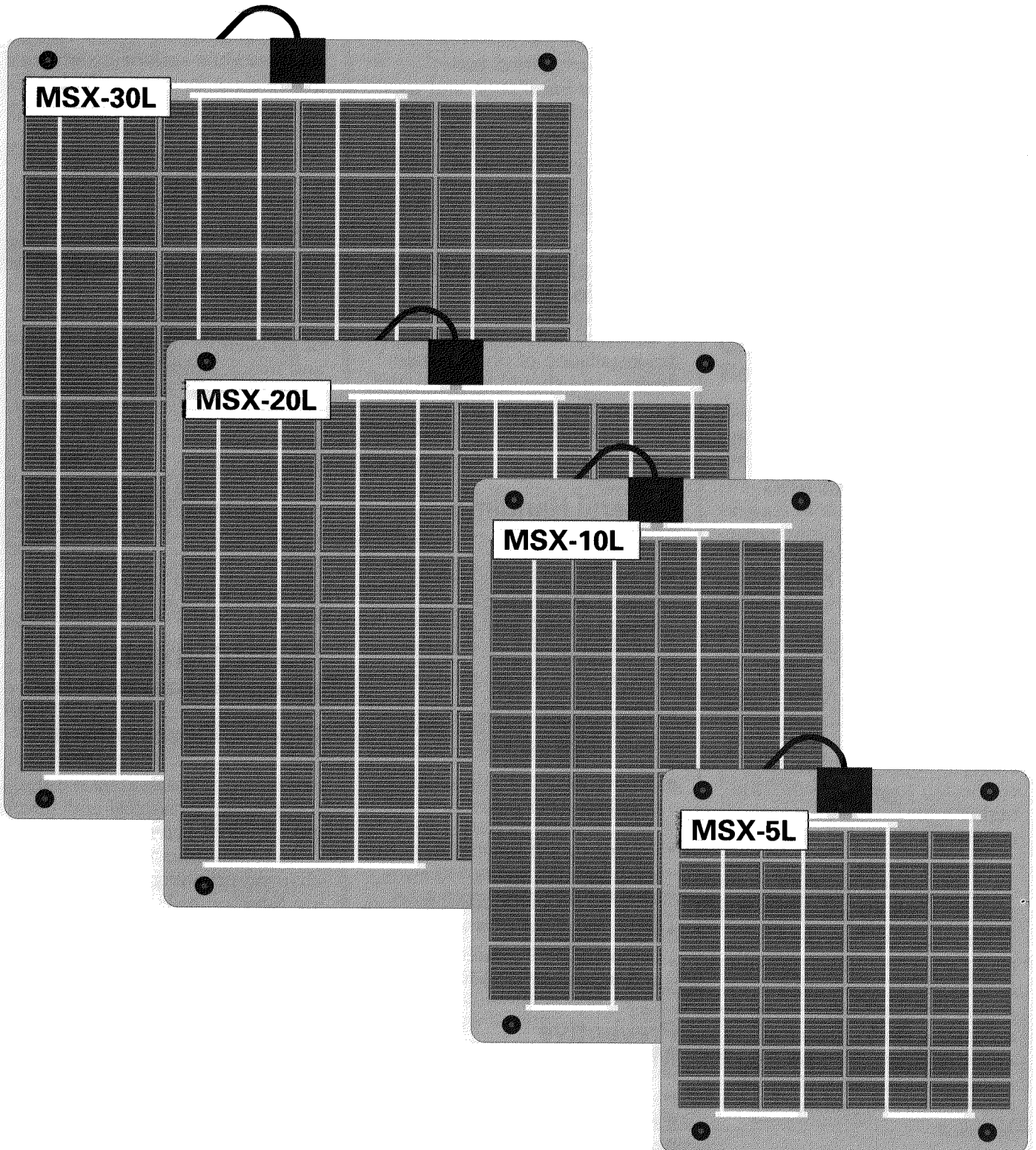


MSX-Lite™ Modules



Warnings and Precautions

General Information

This instruction sheet provides information about Solarex™ MSX-5 Lite, MSX-10 Lite, MSX-20 Lite and MSX-30 Lite photovoltaic modules. These modules produce approximately 5, 10, 20, and 30 watts of power, respectively, at peak power operation. Each is available in a nominal 6-volt or 12-volt configuration.

Before installing, wiring or using a module, it is important to read and understand the instructions provided in this information sheet. Installers should be familiar with the basic principles of electricity and electric appliances.

Electric Shocks and Burn Hazard

Photovoltaic modules generate direct current (DC) when exposed to sunlight or other sources of light. Even though single modules produce low voltage and current, shocks and burns can still result from contact with module output wiring. These hazards increase when multiple modules are connected together to provide higher system voltage or current levels.

PV modules do not have to be "connected" (i.e., powering a load) to generate electricity. Since modules produce electricity whenever light is present, the module front surfaces should be completely covered by an opaque cloth or other material before electrical connections to the modules or other system components are handled.

Storage Batteries

When using a storage battery with photovoltaic modules, the battery manufacturer's safety recommendations should be followed.

Local Codes

In some areas, local codes govern the installation and use of photovoltaic modules. In particular, these codes may specify requirements for module installation on rooftops, exterior walls, boats or motor vehicles.

National Electrical Code (NEC) for U.S.A.

The United States NEC addresses the installation of photovoltaic devices and should be consulted for recommendations, especially when installing multiple-module systems.

General Handling and Use

- Even though the module is rugged, handle it with care. Impact on the front surface can damage the module.
- Do not step on the module.
- Do not bend the module more than 1 inch per foot.
- Do not attempt to disassemble the module.
- Do not concentrate light on the module in an attempt to increase its power output.
- When working with modules, use properly insulated tools and wear rubber gloves.

Preventive Maintenance

Inspect the module twice a year for overall integrity. Make certain that connections to the load

and/or battery are tight and free of corrosion.

Cleaning

Dirt accumulation on the module's front surface can reduce the light energy collected by the module, decreasing its power output.

If the module surface is dirty, gently clean it with a soft cloth or sponge using water and a mild detergent. Do not use a scrub brush; it may damage the module front surface. Wear rubber gloves to protect against possible electric shock.

Disclaimer of Liability

Since the conditions or methods of installation, operation, use and maintenance of PV modules are beyond its control, Solarex does not assume responsibility and expressly disclaims liability of loss, damage, or expense arising out of or in any way connected with such installation, operation, use, or maintenance.

Application Information

Module Description

See the appropriate data sheet for general mechanical and electrical characteristics of the module. Specific electrical characteristics of each module are listed on its label.

Uses

The 12-volt version of the module can be used to charge 12-volt storage batteries or for direct operation of 12-volt DC appliances. The 6-volt version is for

use with batteries or appliances rated at 6-volts DC.

Multiple modules may be connected in parallel, series, or parallel/series configurations to produce increased current and/or voltage. Bypass diodes may be required in these configurations; consult your Solarex dealer for specific recommendations.

Installation

Orientation

When installing photovoltaic modules, be aware that they generate maximum power when facing the sun directly. The fixed position which approximates this ideal over the course of the year, thus maximizing annual energy production, is facing due South (in the Northern Hemisphere) or due North (in the Southern Hemisphere) at the angle listed in the table below. Note that these orientations are **true, not magnetic** North and South.

Tilt Angle

The table below shows the fixed angle above horizontal at which modules should be installed in order to maximize annual energy output. At some installations, it may be cost-effective to adjust the tilt seasonally. At most latitudes, performance can be improved during the summer by using an angle flatter than the chart's recommendation; conversely, a steeper angle can improve winter performance.

Latitude of site	Tilt Angle
0-4°	10°
5-20°	Add 5° to Local Latitude
21-45°	Add 10° to Local Latitude
45-65°	Add 15° to Local Latitude
65-75°	80°

If modules are not cleaned regularly, it is recommended that they not be mounted at an angle flatter than 15°. Flatter angles cannot take full advantage of the cleansing action of rainfall.

Example: A module mounted in Miami, Florida (latitude 26°) should be tilted at approximately 36° from horizontal, and should be faced due south.

Shading

Locate modules so they are as free as possible from shading during all seasons, particularly during the middle (the most energy-productive) part of the day. The module should be oriented with the junction box edge lowest to minimize shading by the box itself.

Mounting Recommendations

MSX-Lite modules may be mounted on wooden supports constructed from framing timbers such as "two-by-fours" (2-inch-by-four-inch lumber). Recommended hardware is 1-1/2-inch-long #10 wood or lag screws, fitted with matching washers, through the four grommeted mounting holes in each module.

Do not over-tighten or bend the module more than 1 inch per foot during mounting.

Modules can also be mounted on a flat wooden surface, such as 1"-thick plywood. Such an installation, however, prevents natural airflow from cooling the back of the module, an effect which enhances module performance slightly. If this enhancement is desired, the installation should allow airflow across the module back.

Modules can also be mounted to metal strips,

angle, or U-channel by fasteners such as a #10-24 bolt with washer over the grommet.

Tools Needed

Heavy screwdriver or socket wrench for #10 screw, (wood or lag-type) of 1 1/2" minimum length.

Electrical Connections

The module's red output conductor is positive (+); the black conductor is negative (-). When wiring the module to a battery or appliance, be certain to match polarity, connecting + to + and - to -.

Blocking Diodes and Charge Control Regulation

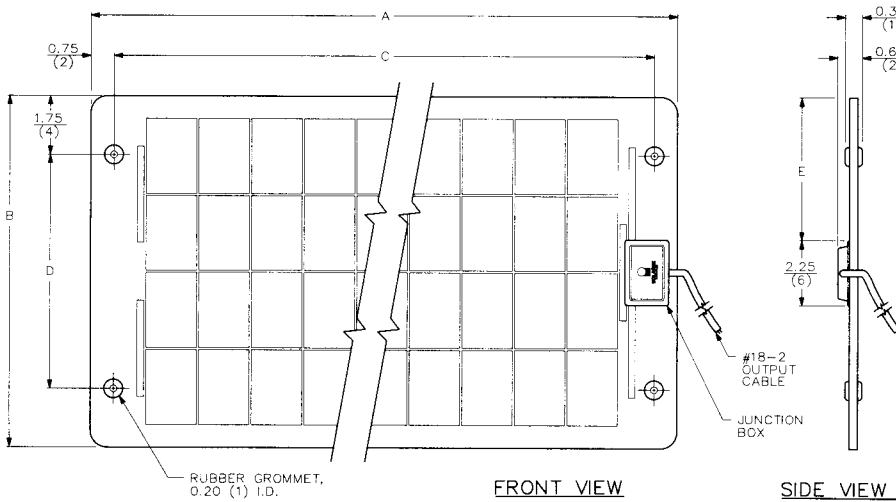
Depending upon its use, the MSX-Lite module may require either a blocking diode, which prevents battery discharge during periods of darkness, or a battery charge regulator, which prevents storage batteries from being overcharged and possibly damaged or destroyed.

For installations requiring charge regulation, Solarex recommends its Solarstate™ Control, which includes a blocking diode. The efficient and inexpensive Solarstate regulator is very easy to install. Contact Solarex sales for additional information.

The matrix below provides general guidelines for choosing either a blocking diode or regulator.

Does daily current into battery exceed daily current drawn from battery?	Is module connected at night?	
	Yes	No
Yes	Solarstate	Solarstate
No	Blocking Diode	No Regulation Required

Mounting Dimensions



	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
MSX-5L	10.75 (27)	10.50 (27)	9.25 (23)	7.00 (18)	4.13 (11)
MSX-10L	17.50 (44)	10.50 (27)	16.00 (41)	7.00 (18)	4.13 (11)
MSX-20L	17.50 (44)	19.50 (50)	16.00 (41)	16.00 (41)	8.63 (22)
MSX-30L	24.25 (62)	19.50 (50)	22.75 (58)	16.00 (41)	8.63 (22)

DIMENSIONS GIVEN IN INCHES AND CENTIMETERS (CENTIMETERS SHOWN IN PARENTHESIS).

Limited Five Year Warranty on Power Output

For five (5) years from the sale of the product to the original consumer purchaser, Solarex will replace the lost power of any modules that fail to produce at least ninety percent (90%) of the minimum power output specified by Solarex at the time of delivery. Power output shall be measured by Solarex using standard Solarex test conditions. Solarex will replace such lost power, up to the minimum output originally specified, either by providing the purchaser with additional modules to make up the total wattage lost or by repairing or replacing the module at Solarex's option. This warranty shall only apply while the original consumer purchaser owns the MSX-Lite.

What This Warranty Does Not Cover

This warranty does not apply to any of the above modules which have been subject to misuse, neglect or accident, or which have been damaged through abuse, alteration, improper installation or application, or negligence in use, storage, transportation or handling, or which has been repaired by anyone other than Solarex or an authorized Solarex service representative. This warranty does not cover any

transportation costs for the return of the module or cost associated with installation, removal, or reinstallation of the MSX-Lite.

Warranty Limitations

THERE IS NO OTHER EXPRESSED WARRANTY ON THESE PRODUCTS. SOLAREX IS NOT RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OR LOSS OF USE OF THE PRODUCT.

ANY WARRANTIES IMPLIED BY LAW, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE TERM OF THIS WARRANTY.

Solarex's maximum liability under any warranty, expressed, implied, or statutory, is limited to the purchase price of the product. The purchaser's exclusive remedy shall be only as stated herein.

SOME JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

Obtaining Warranty Performance

If you feel you have a claim under this warranty, contact the vendor who sold you the product, any authorized Solarex service representative, or Solarex at the address below. You will be advised what you need to do to obtain warranty service.

You should read and follow the installation instructions supplied with the MSX-Lite. If you need to contact Solarex, please write us at the following address:

Solarex
Customer Service Department
630 Solarex Court
Frederick, Maryland 21703

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

Limited Warranty

Limited Warranty - One Year

Solarex warrants the MSX-Lite™ to be free from defects in materials and workmanship under normal applications, use and service conditions for one (1) years from the date of sale to the original consumer purchaser. If the module becomes inoperable due to a defect in material or workmanship during the one (1) year period of this warranty, Solarex will, at its option, either repair or replace the product, or if it is unable to repair or replace the product, refund the purchase price.

This warranty shall apply only while the original consumer purchaser owns the MSX-Lite.

Manufactured with pride by Solarex.

We welcome your comments or suggestions for improvement.

A Business Unit of Amoco/Enron Solar