

## AC Transformers

Use an autotransformer as a step-down to connect the 240 VAC output of a generator to the 120 VAC input on an inverter. This allows full output power of a 240 VAC generator to be used for battery charging. Autotransformers can also step-up voltage to operate 240 VAC appliances and motors from the 120 VAC output of an inverter.

### AEE Solar

#### Toroid Autotransformers

These AC step-up and step-down **Toroid Autotransformers** are greater than 98% efficient and cause less than 0.2% idle loss at no load. Nearly silent when operating, they include a NEMA 3R enclosure with knockouts for conduit. 2-year warranty.



AEE Solar Toroid Autotransformers			
Description	Standby power	Dimensions	Item code
2.5 kW autotransformer	<5 W	8" x 8" x 4"	<b>038-09437</b>
4.0 kW autotransformer	<8 W	10" x 10" x 4"	<b>038-09440</b>
8.0 kW autotransformer	<16 W	12" x 10" x 6"	<b>038-09445</b>

### OutBack Power

#### PSX-240 Autotransformer

The **OutBack PSX-240 autotransformer** can be used for step-up, step-down, generator, and split phase output balancing, or as a series stacked inverter to load balancing auto-former.

The PSX-Relay version has a relay assembly, which is required when split-phase stacking with 120/208 VAC power sources.

Both units have a built-in two-pole 25A AC breaker and cooling fan. ETL Listed.



OutBack PSX-240 Autotransformer		
Model	Description	Item code
PSX-240	4 kW autotransformer	<b>030-04429</b>
PSX-240-Relay	4 kW autotransformer with relay	<b>030-04430</b>

## DC-DC Converters

DC to DC converters are used to power appliances requiring a different voltage than the battery bank supplies. For example, powering a 12 VDC appliance that needs to be run from a 24 VDC or 48 VDC batter bank. Using a DC-DC converter is preferred for powering loads that require a different voltage than the battery bank's system voltage. When necessary, a battery equalizer can be used to help keep the individual cells equally charged in a battery bank that is used to supply power to a lower voltage load by center tapping the battery. Connect the equalizer across the battery to keep the whole string equally charged.

### Samlex

#### DC-Step-Down Power Converters

These switching **DC-DC Step-Down Power converters** are designed to decrease DC voltage. They operate at high efficiency and provide regulated 13.8 VDC output from an input of 20-30 VDC. Use them to power 12 VDC lights and appliances from a 24 VDC system. 2-year warranty.



Samlex DC-Step-Down Power Converters		
Model	13.8 VDC output max amps	Item code
SDC-15	12 A	<b>030-08720</b>
SDC-23	20 A	<b>030-08725</b>



## Isolated DC-DC Converters

These **isolated, enclosed DC-DC converters** are designed to increase or decrease DC voltage. 100 W, 200 W, and 360 W versions are available.

Samlex Isolated DC-DC Converters				
Model	Input voltage	Output voltage	Max output amps	Item code
IDC-100B-12	20-35 VDC	12.5 VDC	8 A	030-08741
IDC-100C-12	30-60 VDC	12.5 VDC	8 A	030-08742
IDC-100A-24	9/18 VDC	24 VDC	4 A	030-08744
IDC-100C-24	30-60 VDC	24 VDC	4 A	030-08746
IDC-200B-12	20-35 VDC	12.5 VDC	16 A	030-08748
IDC-200C-12	30-60 VDC	12.5 VDC	16 A	030-08749
IDC-200A-24	9-18 VDC	24 VDC	8 A	030-08751
IDC-200C-24	30-60 VDC	24 VDC	8 A	030-08753
IDC-360A-12	9-18 VDC	12.5 VDC	30 A	030-08755
IDC-360B-12	20-35 VDC	12.5 VDC	30 A	030-08756
IDC-360C-12	30-60 VDC	12.5 VDC	30 A	030-08757
IDC-360A-24	9-18 VDC	24 VDC	15 A	030-08758
IDC-360C-24	30-60 VDC	24 VDC	15 A	030-08760

## Solar Converters Inc.

### DC Battery Equalizers

These high-efficiency **DC to DC battery equalizers** are bi-directional so they can be used to balance a battery bank either from a load on only part of the battery bank, or from a charging source that is a different DC voltage than the battery. These converters keep the battery halves equally charged when center-tapping the battery. For instance, run a 12 V load attached to one 12 V battery in a 24 or 48 V battery string, and these units ensure that the battery remains evenly charged. 1-year warranty.



Solar Converters DC Autotransformers				
Model	Voltage	Amps		Item code
		Low voltage	High voltage	
EQ 12/24-20	12/24 VDC	20 A	10 A	038-08209
EQ 12/24-50	12/24 VDC	50 A	25 A	038-08751
EQ 12/48-10	12/48 VDC	10 A	2.5 A	038-08745
EQ 12/48-30	12/48 VDC	30 A	7.5 A	038-08760
EQ 24/48-10	24/48 VDC	10 A	5 A	038-08748
EQ 24/48-30	24/48 VDC	30 A	15 A	038-08754

## Generator Start Controls

It is very important to prevent battery banks from being discharged too far. These specialized controllers send a start-up signal to a back-up or remote power generator when the battery bank reaches a given voltage set point. Note that not all start controllers work with all generators. Contact AEE Solar to assess or confirm compatibility.

### Magnum

#### AGS - RV Auto Generator Start



The **Magnum Automatic Generator Start (AGS)** is designed to automatically start a mobile generator based on low battery condition or the inside temperature of the RV and is compatible with most major generators, including Onan, Powertech, Generac, and Weterbeke.

Battery start voltage can be set from 10-12.2 VDC or 20-24.4 VDC or 40-48.8 VDC, the start temperature from 65-95°F, the run time from 0.5 to 25.5 hours, and the quiet time with an easy-to-set clock. Automatic Generator Start settings do not interfere with the manual start/stop operation of the generator.

Two models are available. The **standalone version** of the AGS works well for installation and operation without an inverter. The **network version** of the AGS allows operation of the AGS via the ME Series remote panel.

Magnum Auto Generator Start		
Model	Description	Item code
AGS-S	Automatic generator start standalone	020-06375
AGS-N	Automatic generator start network version for use with Magnum inverters only	020-06377

### Atkinson

#### GSCM



The **Atkinson GSCM** (generator start controller module) is a microprocessor-based generator-starting controller that receives start commands from any 12 VDC output or dry-contact switch, including an inverter or charge controller auxiliary relay, a voltage controlled relay, a timer, a water tank float switch, or any user-supplied contact closure. It automatically controls a gas/propane or diesel powered generator or pump, and is sealed for harsh environment operation.

The GSCM provides contact signal relays to start the engine and to disconnect the starter when a minimum generator frequency output is measured. It can monitor the generator operation, shutting it down and displaying the fault conditions detected. The GSCM must be manually reset after a generator fault.

The GSCM is powered by 12 to 24 VDC from a battery bank and will start generators for 12 to 48 VDC systems. For 48 VDC systems the GSCM must be powered by a 24 VDC-or-less tap on the 48 VDC battery bank, or from the generator's starting battery. The GSCM provides a 30-day exercise function that can be synchronized with a photovoltaic input to only start each 30-day period at the beginning of the solar charge day. It also has a timed relay that can be used for diesel engine glow plugs. 2-year limited warranty. Dimensions are 5.5"H x 3.3"W x 1.5"D.

#### GSCM-mini



This **GSCM-mini** generator start controller is optimized for use with OutBack inverters. It supports three types of 3-wire gas-generator control: momentary, maintained, or ignition. It has a fixed crank time and over and under frequency shutdown. 2-year limited warranty.

Atkinson Auto Generator Start		
Model	Description	Item code
GSCM	Generator start control module	020-06341
GSCM-mini	Generator start control module - mini	020-06343

## Relays and Controls

The simple controls presented here enable you to automate certain functions for your renewable energy system, such as turning on/off a load or starting/stopping a generator or inverter based on logical conditions, such as battery voltage, time of day, or sensor reading. Relays enable a small control voltage signal to open or close a switch for a much larger voltage and current. Select relays and design your system so that it will "fail safe" if the control signal is lost.



### Morningstar

#### Relay Driver

The **Morningstar Relay Driver** is a logic module that provides control functions such as high / low voltage alarms, load control, and generator start functions for 12, 24 or 48 VDC battery systems. It controls 4 independent relay driver outputs by reading battery voltage or by digital data inputs from any Morningstar controller or inverter, which includes an RJ-11 meter port (TriStar, TriStar MPPT, SunSaver Duo, SunSaver MPPT or SureSine). Multiple Relay Drivers can connect to a single controller or to multiple devices in a MeterHUB/MeterBus network. Outputs can be used to operate any mechanical or solid state relay with a coil voltage that is the same as the battery voltage used to power the Relay Driver. Maximum current for each output channel is 750 mA.

The Relay Driver is pre-programmed with four commonly used settings and may be mounted to a DIN rail or a flat surface. An RS-232 port and PC software (MS View or MODBUS commands) is included for custom programming, detailed monitoring and driver control. The driver terminals can accept #16 or 24 AWG wire. Self-consumption is less than 20 mA and the unit operates from 8 to 68 VDC. The Relay Driver is highly reliable: each channel has complete electronic protections for short circuit, overcurrent, reverse polarity, and lightning and transient surges. LED indicators display power and status for each channel as well as faults and data sampling intervals. Operating temperature range is -40°C to +45°C. Dimensions are 6.4"H x 3.2"W x 1.3"D and it weighs 0.4 lb. 5-year warranty.

Morningstar Relay Driver		
Model	Description	Item code
RD-1	Morningstar Relay Driver	020-01255
RSC-1	Communications Adapter EIA-485 / RS-232	020-01256
HUB-1	MeterHUB	020-01260
DIN-1	DIN Rail Clips for Installing the Relay Driver to DIN Rails	020-01259

### Solar Converters Inc.

#### Voltage-Controlled Switches



These **Voltage-Controlled Switches** are user-adjustable voltage-activated relays with single pole, double throw (SPDT) contacts rated for 30 A. The relay coil in the "Active-High" version is powered when the voltage rises to the high set point; "Active-Low" is powered when voltage drops to the low set point. The SPDT relay allows the switch to either connect or disconnect a circuit or turn one load on while turning another off. Voltage settings are user-adjustable and can be read with a voltmeter.

An active-high relay can be used as a DC pump controller, a diversion load controller, or to operate a large relay for a high-powered charge controller. An active-low relay can be used as a 2-wire generator start controller or as a low battery voltage load disconnect. These devices consume 17 mA when off. Maximum switched current is 30 A at 12/24 VDC, 3 A at 48 VDC. VCS-1 measures approximately 3"H x 5.3"W x 1.75"D. VCS-2 comes in a 5"H x 7"W x 2"D enclosure. 1-year warranty.

Voltage Controlled Switches			
Model	Mode of operation	Enclosure	Item code
VCS-1AH	Active high	No	020-06218
VCS-2AH	Active high	Yes	020-06215
VCS-1AL	Active low	No	020-06221
VCS-2AL	Active low	Yes	020-06224



### SPDT 12 VDC 40 A Relay

This single-pole, double-throw (SPDT) 40 A enclosed relay is widely used in the automotive industry. Wires may be attached with ¼" quick-connect terminals or a relay socket. Nominal operating current is 140 mA. The corresponding **Relay Socket** has 2 feet of wire.



### SPST N.O. 12 VDC 75 A Relay

This enclosed single-pole, single-throw (SPST) relay has one set of contacts that closes when power is applied to the coil terminals. It can be used to turn on 12 VDC loads of up to 75 A. Power terminals are 10-32 screws and coil terminals are quick disconnects. Nominal operating current is 300 mA.



### DPDT 30 A Relay

This double-pole, double-throw (DPDT) relays can be used for up to 30 A at 12, 24, or 48 VDC or 120 or 240 VAC. All contact surfaces are silver alloy with gold flashing. Contact terminals are #8-32 screws, and coil terminals are #6-32 screws. Relays with 120 VAC or 240 VAC coils can be used to build simple transfer switches. Relays with DC coils can be used for remote operation of pumps and fans. By connecting a relay with a DC coil to a voltage controlled switch, AC or DC loads may be turned on or off based on battery voltage levels.



### Omron SPST 10 A Relay

This enclosed surface mount single-pole, single-throw (SPST) relay has one set of contacts that closes when power is applied to the coil terminals. It can be used with an inverter or charge controller's 12 VDC auxiliary output to provide a contact closure for generator start or other controls. The terminals are quick-connect. It draws a small 44 mA coil current.

Relays		
Description	Coil current	Item code
40 A SPDT 12 VDC relay	140 mA	053-08290
Relay socket for 40 A relay	--	053-08291
75 A SPST relay	300 mA	053-08293
DPDT 30 A relay - 12 VDC coil	170 mA	053-08281
DPDT 30 A relay - 24 VDC coil	53 mA	053-08287
DPDT 30 A relay - 120 VAC coil	83 mA	053-08278
DPDT 30 A relay - 240 VAC coil	42 mA	053-08284
Omron relay SPST 10 A 12 VDC coil	44 mA	053-08298

# Battery Chargers

AC input battery chargers can be used with AC generators to provide battery charging on an emergency basis or in the absence of a renewable energy source. Proper charging is vital to battery health so a high-quality charger is a good idea if you plan to charge batteries from an engine generator.

## Schneider Electric

### Truecharge2 12 VDC Battery Charger



The **Truecharge2** is available as a 20 or 40 A electronic battery charger for deep cycle batteries. Switch settings give correct charge for flooded, gel, or absorbed glass mat (AGM) batteries. These chargers include: selectable 2 or 3 stage charging (3-stage includes float charge), manual equalize charge button, and manual or automatic temperature compensation. The optional temperature sensing probe corrects charge voltage for actual battery temperature. These chargers have full output even with low-cost 1,000 to 3,000 W generators. 1-year warranty.

Schneider Truecharge2 Battery Charger					
Model	Battery voltage	Charge current	Dimensions (L" x W" x H")	Weight	Item code
TC2-40	12 VDC	40 A	9.8 x 6.7 x 2.8	4.8 lbs	045-02896
TC2-20	12 VDC	20 A	9.8 x 6.7 x 2.8	4.8 lbs	045-02895
808-0232-01	Remote temperature sensor				045-02898
808-8040-01	Remote control panel				045-02897

## IOTA

### DLS Converter/Chargers



The **DLS** series converter/charger quickly and efficiently charges batteries from the full rated output of the DLS. The DLS then maintains the batteries, only putting into the battery what is required by load or self-discharge, cutting back to milliamps as the battery requires. The DLS series converter/power supply is protected against low line voltage spikes from the AC power source, or from improperly adjusted generators. When used as a power supply, the DLS model will only supply what is required by the load. When not in use, it is essentially off, minimizing electricity usage. External fuses can be quickly and easily replaced. There is a socket and jumper that can be used to change the charge voltage limit to either 13.6 or 14.2 VDC (multiply by 2 for 24 VDC and 4 for 48 VDC batteries). Chargers have 120 VAC input. 75 A and larger chargers have 120 VAC 20 A plugs. 2-year warranty.

### IQ-4 Smart Controller

The **IQ-4** makes the DLS charger into a 3-stage charger with bulk, absorption, and float charging. It will bulk charge to 14.8 VDC for 15 minutes after it has reached the set-point, or for 3.75 hours. It will then absorb charge at 14.2 VDC for 8 hours, and then drop to float charge at 13.6 VDC (multiply by 2 for 24 VDC and 4 for 48 VDC batteries). If the battery remains in float stage for 7 days, it delivers a bulk charge. The IQ-4 is not recommended for generator-powered battery charging if generator is only run for short periods of time.

IOTA Battery Chargers					
Model	Battery voltage	Charge current	Dimensions (L" x W" x H")	Weight	Item code
DLS-15	12 VDC	15 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02112
DLS-30	12 VDC	30 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02115
DLS-45	12 VDC	45 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02118
DLS-55	12 VDC	55 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02121
DLS-75	12 VDC	75 A	13 x 6.7 x 3.4	7.8 lbs	045-02124
DLS-90	12 VDC	90 A	13 x 6.7 x 3.4	7.8 lbs	045-02127
DLS-27/15	24 VDC	15 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02130
DLS-27/25	24 VDC	25 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02133
DLS-27/40	24 VDC	40 A	13 x 6.7 x 3.4	7.8 lbs	045-02136
DLS-54/13	48 VDC	13 A	9.7 x 6.7 x 3.4	5.0 lbs	045-02147
IQ-4	12-24 VDC	Smart controller for 12 to 24 V chargers			045-02103
IQ-4-54V	48 VDC	Smart controller for 48 V charger			045-02104

## Diversion Loads

Wind and hydroelectric generators can be damaged if they are allowed to run without a steady load, as can battery banks if they are overcharged. Diversion loads, usually resistive heating elements, are used to provide a safety load for when the battery bank is fully charged and cannot accept more energy. The diversion load is generally switched on by a controller or relay driven by battery voltage.

### Low-Voltage Water Heating Elements

These **low-voltage water heating elements** are used as diversion loads for wind or hydroelectric systems. Use one or more of these heating elements with a charge controller designed for load diversion, such as the Xantrex C-40 or C-60, or the Morningstar TS-45, or TS-60 PWM controllers to turn your excess power into hot water. They fit most electric water heaters with screw-in elements. One model is available for **12 and 24 VDC** systems and another for higher power **24 and 48 VDC** systems. Each unit has two elements that can be wired in series, parallel, or used individually, depending on voltage and desired current draw. See table to determine what each element will draw at various charging voltages. If your water heater tank is designed for square flange elements, use one square flange adapter for each element. 1" male pipe threads. 2-year warranty.



Low-Voltage Water Heating Elements									
Regulation voltage			14 V		28 V		56 V		Item code
Model	Wiring	Ohms	Amps	Watts	Amps	Watts	Amps	Watts	
12/24 VDC	series	0.96 Ω	14.6 A	204 W	29.2 A	817 W	--	--	021-09275
	single	0.48 Ω	29.2 A	408 W	--	--	--	--	
	parallel	0.24 Ω	58.3 A	817 W	--	--	--	--	
12/24/48 VDC	series	2.48 Ω	5.6 A	79 W	11.3 A	316 W	22.6 A	1,265 W	021-09279
	single	1.24 Ω	11.3 A	158 W	22.6 A	632 W	--	--	
	parallel	0.62 Ω	22.6 A	316 W	45.2 A	1,265 W	--	--	
Square flange element adapter									021-09285

### Air Heating Diversion Loads

These resistive loads enclosed in vented aluminum boxes can be used in 12, 24, and 48 VDC diversion regulation systems. The aluminum box may get very hot in operation and should be mounted on a non-flammable surface at least 12" from any flammable material. 2-year warranty.

**HL-100** is shipped as a 4 Ω resistor and can be reconfigured as a 1, 0.5 or 0.25 Ω resistor by changing connections in the terminal block.

**HL-75** is shipped as a 3 Ω resistor and can be reconfigured as a 0.7Ω resistor by changing connections in the terminal block. See table for diverted amps at various voltages.



Air Heating Diversion Loads								
Model	Resistance setting	Diversion load amps at these voltages						Item code
		14 VDC	15 VDC	28 VDC	30 VDC	56 VDC	60 VDC	
HL-100	0.25 Ω	56 A	60 A	--	--	--	--	021-09330
	0.5 Ω	28 A	30 A	--	--	--	--	
	1 Ω	14 A	15 A	28 A	30 A	--	--	
	4 Ω	305 A	3.8 A	7 A	7.5 A	14 A	15 A	
HL-75	0.75 Ω	19 A	20 A	38 A	40 A	--	--	021-09335
	3 Ω	4.7 A	5 A	9.3 A	10 A	19 A	20 A	

## MidNite Solar Clipper



The **MidNite Clipper** is designed to control Wind or Hydro turbines and work with the MidNite Classic charge controllers. The Clipper communicates with the Classic to slow the turbine when the batteries are full, and also contains a stand-alone self-powered adjustable max VOC limiting circuit, which protects the turbine from over-speed. The Clipper has a settable voltage threshold and a braking feature that provides convenient switching between run/turbine slowing, all in a rugged powder-coated enclosure.

The Clipper protects charge controllers and other electronics by sensing the incoming voltage from the turbine and using its internal loads as needed to hold down the incoming voltage to a value that you set.

When used with a Classic MPPT charge controller, the Classic uses its auxiliary output to control the Clipper to provide optimum performance. The internal load should be sized according to the turbine that it is used with to provide adequate braking, but not overload the turbine. When the slider on the side of the Clipper is in the stop position the input voltage (DC or Three-Phase) is held to zero volts through 50 amp circuit breakers to provide emergency braking. All models have a temperature-controlled internal fan.

The Clipper has a type 1 enclosure and should be installed only in a protected dry indoor location with adequate ventilation on all sides. The air exiting the exhaust of the Clipper will be hot when the Clipper is slowing the turbine. A minimum of 8" of clearance on the sides and bottom and 24" above the Clipper are recommended.

The AC Clippers are designed to work with AC turbines that have wild three-phase AC output and they convert the AC into DC for input into charge controllers such as the MidNite Classic. The AC Clipper contains two 277 VAC 50 amp 3-phase AC breakers (one for a stop switch) and a 1,200 volt 200 amp 3-phase bridge rectifier.

The 1,500 watt AC Clipper is for AC turbines up to 1,500 W. Standard values available are 0.8 and 2.0 ohms per phase.

The 4,000 watt AC Clipper is for AC turbines up to 4,000 W. Standard values available are 0.4, 1.0, 1.6 and 4.0 ohms per phase.

The 4,000 watt DC Clipper is for turbines with direct DC output. The standard values available are 0.5, 1.2, 1.3, 3.0, 4.8 and 12 ohms.

MidNite Solar can custom-build other resistance values upon request and have designed an easy to change resistor insert for the Clipper allowing changes in the field. Please contact AEE Solar Technical Support for help picking the correct resistance or if you need a value not listed.

Dimensions for all Clipper models are 25.5"H x 15.5"W x 5.25"D and weigh 50 lbs.

MidNite Solar Clipper				
Model	Input power type	Rated wattage (max)	Resistance value	Item code
MNCLIP1.5KAC0.8	AC	1,500 W	0.8 Ω	021-00201
MNCLIP1.5KAC2.0			2.0 Ω	021-00202
MNCLIP4KAC0.4		4,000 W	0.4 Ω	021-00301
MNCLIP4KAC1.0			1.0 Ω	021-00303
MNCLIP4KAC1.6			1.6 Ω	021-00305
MNCLIP4KAC4			4.0 Ω	021-00307
MNCLIP4KDC0.4	DC	4,000 W	0.5 Ω	021-00401
MNCLIP4KDC0.4			1.2 Ω	021-00403
MNCLIP4KDC0.4			1.3 Ω	021-00405
MNCLIP4KDC0.4			3.0 Ω	021-00407
MNCLIP4KDC0.4			4.8 Ω	021-00408
MNCLIP4KDC0.4			12.0 Ω	021-00410