System Protection

Photovoltaic, wind and hydroelectric systems usually have long runs of exposed wire that can pick up surges from lightning, even if the lightning strike is not nearby. These power surges can damage sensitive electronic components in meters, inverters, and charge controls. Surges can also damage telephone, computers, audio and video equipment connected to the power system. It is a good idea to install surge protection on any incoming wires in the system, including incoming PV, wind or hydroelectric power lines, AC generator lines, telephone and antenna leads.

Lightning arrestor can be installed in existing systems that are not presently protected. Each model we offer come with complete installation instructions. Proper grounding is absolutely necessary for lightning protection to be effective!

Outback DC Ground Fault Protection System

The Outback Power systems GFP/2 is required for PV Arrays mounted on dwelling roofs. A GFP/2 protects wiring and system components for one or two PV arrays: Dual 80 amp PV circuits 125 VDC max Voc. Requires three small breaker spaces. The GFP/@ has stud terminals. The OBDC-GFP/2 system includes the GFP unit, a ground bus bar, neutral and ground connection, wiring and mounting hardware.

53-100	**OBDC-GFP System**	**$169**

Xantrex PVGFP

The Xantrex PV Ground Fault Breakers disconnect the solar array if a ground fault occurs in the wiring. These breakers can be ordered in one through four pole configurations. The PVGFP works with 12, 24, and 48 VDC systems with or without batteries.

	Xantrex PVGFP	
53-201	**One Pole**	**$385**
53-202	**Two Pole**	**$429**
53-203	**Three Pole**	**$499**
53-204	**Four Pole**	**$575**

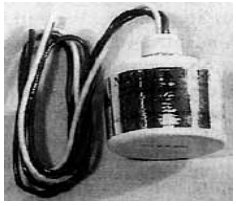
Negative Bus Bar

Use as a common negative with a fuse block above to make your own load center. It has 11 holes that will hold #10 gauge wire or smaller and 4 holes that will accept 2 gauge or smaller wire.

53-060	**Negative Bus Bar**	**$34**

Delta Lightning Arrestor

Silicon Oxide Varistor type arrestors with maximum current rating of 60,000 amps and 2,000 joules per line. Their response time is 25 nanoseconds to clamp 50,000 amps. They are waterproof and mount easily in a 1/2" knockout. Install on the input terminals of the PV system charge control, either at the array or on the PV charge control box. Install the DC version for surge protection on wires coming from a PV array, wind generator or DC hydroelectric turbine. The AC version can be mounted in your AC load center to protect 120/240 VAC equipment. They are a good idea if you have AC wiring running outside of the building, such as generators, pumps or outbuildings.



53-903	**LA302DC, DC Surge Arrestor up to 300V**	**$89**
53-904	**LA602DC, DC Surge Arrestor up to 600V**	**$99**
53-902	**LA302R, AC Surge Arrestor up to 300VAC single phase**	**$89**
53-905	**LA603G, AC Surge Arrestor up tp 600VAC three phase**	**$99**

PV Combiner Boxes & Accessories

MidNite Solar

MNPV3 & MNPV6 Combiners

The MNPV3 & MNPV6 combiner is rated for outdoor use. Although designed primarily for combing PV strings up to 150 Vdc, the MNPV6 may be used for combining four high voltage strings using ATM fuses up to 15 amps. The use of touch safe DIN rail mount fuse holders and fuses allow operation up to 600 Volts. The MNPV6 combiner comes with two copper bus bars. One for circuit breakers (6) and one for fuses (4). The MNPV3 bus bar is designed for circuit breakers only. Type 3R aluminum chassis with flip up cover. ETL listed for Canada.

Applications:

" PV combiner up to six strings using DIN breakers rated for 150 Vdc
" 120 amps total output PV combining up to four strings using ATM 6, 10 or 15 touch safe fuse holders rated for 600 Vdc
" DC load center using 150 Vdc DIN breakers

Features include:

" All aluminum powder coated housing; light gray
" Flip up cover that can stay in the open position during installation
" PV Negative bus bar with 14 useable openings (10 #14-6 and 4 #1/0-14)
" Chassis ground bus bar with 14 useable openings (10 #14-6 and 4 #1/0-14)
" Standard DIN rail to mount up to 6 breakers or 4 fuse holders (MNPV6)
" Tin plated copper bus bar to combine breaker outputs (MNPV6 busbar may be split in two)
" Dead front cover snaps into place after wiring is complete for safety
" Knock outs for PV in and PV out on bottom and sides
" Top surface is available to bring conduit in from directly above the enclosure

30-830	**MNPV3 PV Combiner Box, 3 strings**	**$169**
30-831	**MNPV6 PV Combiner Box, 6 strings**	**$209**
53-931	**Breakers, 6-30 Amp**	**$29/ea**

OutBack

FLEXware PV Combiners

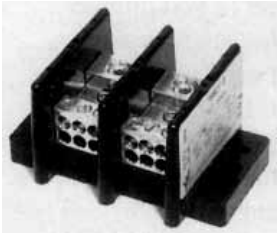
The OutBack Power Systems FLEXware PV combiner series is ideal for both small or large power systems. The FLEXware PV8 and FLEXware PV12 accommodates the over current protection requirements of PV source circuits. From 150 Vdc breakers for low voltage PV systems, to 600 Vdc fuse holders for high voltage PV systems, the FLEXware PV Combiner series handles it all.

Designed to survive in outdoor environments, the rainproof, UL type 3R powder coated aluminum chassis can be mounted on a wall, pole or sloped on 3/12 roof pitch. The angled negative terminal bus bar design makes wiring fast and easy. Dual output combining bus bars with lug terminals are included for up to 2/0 AWG conductors. The tinted flame retardant polycarbonate dead front panel creates a clean appearance while preventing accidental contact with the live terminals. All include GND bus bar. Order circuit breakers or fuse and fuse holders separately. ETL listed in Canada.
FWPV-8 enclosure (size: 15" x 9" x 4") has two 1" and ten 1/2" knockouts
FWPV-12 enclosure (size: 15" x 13" x 4") has two 1" knockouts and fourteen 1/2" knockouts

30-833	**Outback FWPV-8 Combiner Box**	**$298**
30-834	**Outback FWPV-12 Combiner Box**	**$375**
53-931	**Breakers, 6-30 Amp**	**$25/ea**

Power Distribution Blocks

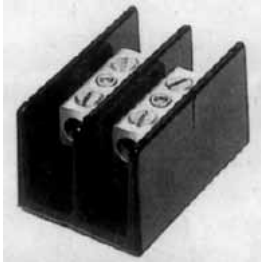
Use these blocks to split primary power into secondary circuits, or join cables from solar array to a power lead-in cable. Install cables and tighten set screws. These are CSA certified for up to 600 volts. The terminal blocks are made of zinc plated aluminum, for use with aluminum or copper wire. Two poles. Primary side accepts one large cable, secondary side accepts six smaller cables.



Catalog#	Primary Wire Size	Secondary Wire Size	Amp Rating Size & Quantity	Price
53-810	**#8 to 2/0**	**#6 to #14 (6)**	**175**	**$ 98**
53-812	**#6 to 6/0**	**#4 to #14 (6)**	**310**	**$124**

Feed Through/Splicer Blocks

Use these blocks to splice two wires of up to #1/0 gauge. They are UL Recognized and CSA certified for up to 600 volts. Terminal blocks are made of zinc-plated aluminum, for use with aluminum or copper conductors. Two poles and 3- pole blocks. One connection on each side.



53-811	**2-Pole Splicer Block**	**$49**

Special Controls

Xantrex Alternator Regulator

With the Xantrex Alternator Regulator, you can turn your high output engine alternator into a powerful three-stage battery charger.

20-432	**Xantrex Alternator Regulator, 12V**	**$325**
20-433	**Xantrex Alternator Regulator, 24V**	**$450**

Panelsource Generator Auto Start Control

The Panelsource provides reliable automatic start/stop and protection control for all types of engine-driven equipment. The operating voltage is 3.5 to 30 VDC continuous and operates in -40C. The Panelsource comes set up for 12 volt generator starting batteries but the 12 volt relay maybe replaced by a 24 volt relay. If using the Panelsource to start the generator on low battery voltage, connect a Voltage Controlled Switch or the Aux relay on Trace SW series inverters to the Panelsource input. 3 year warranty. Features: Replaceable relays, rated at 5 amps • Auto reset fusing • Reversed polarity protection • Failure input light • Multifunction timer output (glow plug, SmartChoke and Slow timer) • Zero speed re-crank • Oil pressure verification

20-430	**Panelsource Generator**	**$499**
20-431	**Annunciation Terminal**	**$ 45**

Automatic Transfer Switch

Safely connect an inverter and an AC generator to the same house wiring. For use with inverters that do not have built-in transfer switch capability. If the generator is not running, the inverter is connected to the house wiring. When the generator is started, the house wiring is automatically disconnected from the inverter and connected to the generator. A time delay feature allows the generator to warm-up before the transfer takes place. The 52-120 is for 120 volt generators and inverters and its use is code approved with installation to Xantrex DR or SW series inverters in an RV or boat where the neutral and line terminals must both be switched.

Catalog #	AC Amps	Generator KW	Dimensions	Price
52-120	**30**	**3.6**	**6” x 6” x 4”**	**$119**

Pathmaker

Pathmaker is a battery combiner that automatically connects 2 or 3 banks for simultaneous charging and isolates them during discharge.

20-434	**Pathmaker 100 Amp**	**$269**
20-435	**Pathmaker 250 Amp**	**$649**

Circuit Breakers & Panels

Blue Sea DC Circuit Breaker/Disconnects

These circuit breakers are vapour proof, weatherproof, and combine switching and circuit breaker function into one unit. They are designed to trip when subjected to a fault current, even if the reset lever is held in the ON position. Maximum: 48 volt DC and 5000 Amps @ 24 volts

53-301 Circuit Breaker $75
DC Amperages available 50, 60, 70, 80, 100, 120, 150

Blue Sea Circuit Breaker Panel

Five 15 Amp A-Series circuit breakers installed, 3 blank positions, 30 Common DC labels. Flush mount.

53-313 Blue Sea DC 8 Circuit Breaker $209

Three 15 Amp A-Series Circuit breakers installed. Flush mount.

53-312 Blue Sea DC 3 Circuit Breaker $149

DC Series Circuit Breakers

Single Pole 15 Ampere main protection fits panels above.

53-314 Blue Sea DC Series Circuit Breaker $19

OutBack Circuit Breakers/Disconnects

Single Pole panel mount breakers for FLEXware power centers and MidNite solar E-panels 1 - 250 Amp

53-935 OBB-X-150VDC/120VAC-PNL Breaker1/10/15/20/30/60/80Amp $35
53-936 OBB-X-150VDC-PNL Circuit Breaker 40/50/70Amp $41
53-937 OBB-X-150VDC-PNL Circuit Breaker 100or 125Amp $89
53-938 OBB-X-150VDC-PNL Circuit Breaker 175 or 250Amp $149

DIN mount AC breakers with set-screw compression terminals for FLEXware and E-panels

53-941 OBB-X-120VAC-DIN 10/15/20/30/50/60Amp single pole $29
53-942 OBB-X-120/240VAC-DIN 15/20/25/30/50/60Amp double pole $55

DIN mount DC breakers with set-screw compression terminals for OutBack PSPV and MidNite MNPV or for DC circuits in FLEXware and E-panels

53-931 OBB-X-150VDC-DIN 1/2/3/4/5/6/8/9/10/12/15/20/30/50/60/63Amp $29

Fuses & Fuse Blocks

Blue Seas ATC 12 Circuit Fuse Block

This blade fuse block accepts lugs on a 3/16 stud for positive and negative feeds, and has 5/32 screws for connection to the positive and negative bus bars. The tin plated buses and fuse clips have a 30 amp rating per circuit. The clear cover insulates all conductive parts and comes with recesses for circuit labelling.

- maximum voltage: 32 VDC
- maximum amperage per block: 100 Amp

53-341 **ATC 12 Circuit Fuse Block** **$ 79**

Blue Seas ATC 6 Circuit Fuse Block

This blade fuse block accepts lugs on a 3/16 stud for positive and negative feeds, and has 5/32 screws for connection to the positive and negative bus bars. The tin plated buses and fuse clips have a 30 amp rating per circuit. The clear cover insulates all conductive parts and comes with recesses for circuit labelling.

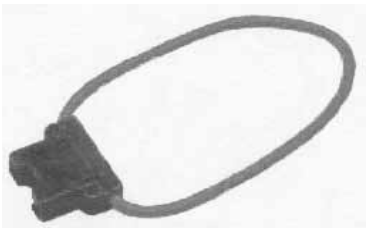
- maximum voltage: 32 VDC
- maximum amperage per block: 100 Amp

53-342 **ATC 6 Circuit Fuse Block** **$65**

ATC Fuses

These Blade type fuses were designed for the automobile industry. They provide better contact and less current resistance than glass tube AGC fuses. These fuses fit in the ATC Fuse Box, ATC Fuse Blocks and in the Inline ATC Fuse Holder. They come in packages of 10 in 5, 10, 15, 20, 25 and 30 amp sizes, but any number below 10 can be ordered at $0.65 each. Specify fuse amp size when ordering.

53-180 **Package of 10 fuses, any size.** **$6.25**



ATC Inline Fuse Holder

This inline ATC Fuse Holder has a snap-on water resistant cover and makes this an excellent choice to fuse a single DC circuit indoors or out. Just cut the #10 gauge wire loop and splice into the line. Price includes one ATC fuse, above, size of your choice.

53-160 **Inline ATC Fuse Holder** **$5**

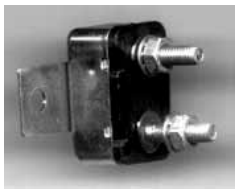
PowerPost Plus Cable Connector

This 150 ampere bus allows small wire connections at high amperage, heavy gauge cable connections.

53-815 **PowerPost Plus Cable Connector** **$15**

DC Safety Fusing & Grounding

Self Resetting 30 & 50 Amp DC Breakers



Wire terminals bolt to breaker on #10 studs. Breaker has mounting bracket. Thermal/short circuit breaker opens when current is exceeded and closes automatically when overload condition is repaired. For 12 volt DC only.

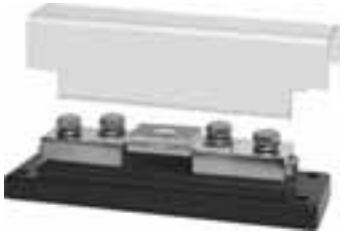
53-138	**30 Amp Auto-Reset Breaker**	**$12**
53-262	**50 Amp Auto-Reset Breaker**	**$15**

ANL Fuses

Use these to fuse main battery cables or large inverters. The ANN 300 amp fuse works well on 12 volt 2500 watt inverters and the ANN 250 works well on 24 volt 2600 watt inverters. Use a 100 amp fuse for inverters from 400 to 800 watts. ANN fuses are not CSA or UL listed, if you want to adhere to the Electrical Codes for interrupting capacity, use the Class T fuses. The fuse holder and cover below holds all ANN fuse sizes. Weight .1 Kg.

Catalog #	Fuse Type	Amperage	Price
53-235	**ANL100**	**100**	**$20**
53-240	**ANL150**	**150**	**$20**
53-245	**ANL200**	**200**	**$20**
53-250	**ANL250**	**250**	**$22**
53-255	**ANL300**	**300**	**$22**
53-265	**ANL400**	**400**	**$22**
53-270	**ANL500**	**500**	**$22**

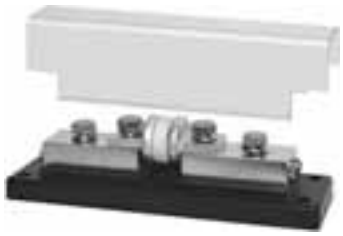
Fuse Block & Cover for ANN Fuses



Use this fuse block with the fuses listed above. It has two 3/8" bolts to attach fuse and cable lugs. Attach large cables to fuse block with ring terminals with 3/8" lug holes. We supply custom made #2, #1/0, 2/0, 4/0 and 6/0 color coded battery and inverter cables. The insulating clear plastic fuse cover is included with the fuse block.

53-275	**Fuse Block for ANL Fuse (100-300Amp)**	**$59**
53-276	**Fuse Block for ANL Fuse (350-500Amp)**	**$85**

Class `T` Fuse Blocks w/ Fuses



Use this single pole fuse block to fuse inverters or other large DC loads. It is easy to install. Just cut the positive battery cable, remove 1" of insulation on each side of the cut, insert the bare cable ends in the lugs on each end of the fuse block and tighten the set screws. A fuse comes installed in the block. It is simple to replace if it ever fails, due to a short circuit condition or excessive current overload. The 110 and 200 amp units will accept up to #2/0 cable. The 300 and 400 amp models will accept up to #4/0 cables. The fuse cover is tough polycarbonate see-through. Order replacement fuses below.

53-450	**Class T 110 Amp Fuse & Block**	**$89**
53-452	**Class T 200 Amp Fuse & Block**	**$89**
53-453	**Class T 300 Amp Fuse & Block**	**$110**
53-454	**Class T 400 Amp Fuse & Block**	**$110**

Class T Fuses

These fuses exceed the 20,000 amp interrupting capacity required to protect Square-D brand circuit breakers in DC load centers.

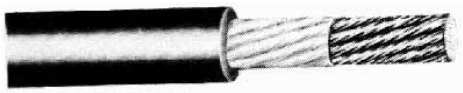
53-430	**Class T 110 Amp Fuse**	**$35**
53-435	**Class T 200 Amp Fuse**	**$35**
53-441	**Class T 300 Amp Fuse**	**$50**
53-440	**Class T 400 Amp Fuse**	**$50**

Cable, Wire & Grounding

Battery & Inverter Cable

Single conductor fine stranded copper cable for high amperage low-resistance applications. Use this for battery to battery interconnects, inverter input and main feeds between batteries and load centers or high amperage disconnects. 100% stranded copper wire. The insulation is resistant to gas, oil, water and grease.

All sizes listed below are available with **Black** insulation and supplied by our Canadian cable suppliers. Cables sizes listed with **Red** insulation are special order. **Specify x = R for Red, or B for Black insulation.**



Catalog#	Gauge	Black Price/Ft.	Red Price/Ft
58-074-x	6	$1.10	$1.10
58-069-x	4	$1.75	$1.75
58-064-x	2	$2.60	$2.60
58-070-x	1/0	$3.75	$3.75
58-079-x	2/0	$5.90	$5.90
58-084-x	4/0	$7.80	$7.80

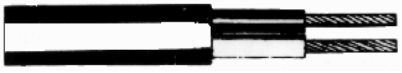
Type RW-90 Wire

This wire is stranded copper alloy and is DirectBurial/Sunlight Proof. Use this for lead-in from PV arrays, wind and hydroelectric generators, and from charge controller to battery circuits. This wire is an excellent choice for the two main DC bus wires feeding power to secondary DC load circuits. It may be used for AC or DC wiring up to 600 volts. Insulation is cross linked polyethylene. #8 & #6 gauge come with black or white insulation. #4 gauge is available with black insulation only.

Catalog#	Gauge	Price/Ft.
58-134	8	$0.75
58-129	6	$1.08
58-124	4	$1.85
58-122	2	$2.90
58-119	1	$3.65
58-117	1/0	$4.42
58-116	2/0	$5.54

Type TC Cable Direct Burial Sunlight Proof

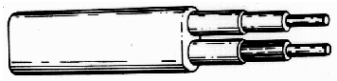
This flexible 2 conductor wire is excellent for outdoor applications like PV array lead-in where the current is not over 20 amps and the runs are short (less than 30 feet), and for sub array wiring. It may be buried directly in the ground or exposed to direct sunlight. It is UL approved. 6 gauge wire special order.



Catalog#	Gauge & Description	Price/Ft.
58-099	10/2 Wires	$1.85
58-094	8/2 Wires	$4.25
58-096	6/2 Wires	$5.35

Duplex Primary Wire Two Conductor Stranded Wire

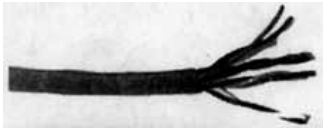
This cable is 100% copper low resistance wire with two color coded conductors of primary enclosed in grey PVC insulation. It is commonly used for PV module interconnects, low voltage house wiring and DC pump wires. Since it is stranded, it can also be used in boats and RVs where vibration is encountered.



Catalog#	Gauge & Description	Price/Ft.
58-024	12/2 Wires	$0.75
58-019-10	10/2 Wires	$1.15
58-019-8	8/2 Wires	$1.45
SOW Cable, water-, oil- and sunlight resistent, rated for 600V		
58-191	10/2	$1.75
58-192	8/3	$3.75
58-193	6/3	$5.71

Twisted-Pair Meter Wire

Use these twisted-pair wires for the TriMetric or E-Meter, which requires twisted pairs. Only 6 conductors are needed for the standard E-Meter. The TriMetric requires only 4 twisted pair wire for installing.



Catalog#	Gauge & Description	Price/Ft.
58-017	22/4 Wires	$0.60
58-018	18/4 Wires	$0.60
58-015	22/8 Wires	$0.55
58-028	18/2 Sensor W.	$ 0.49

Submersible Pump Wire

Two conductor low-resistance stranded copper pump wire for the Shurflo 9300 pumps. Three conductor pump wire is required for ETA & Grundfos deep well solar pumps.

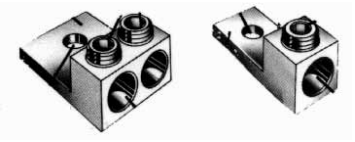
Catalog#	Gauge & Description	Price/Ft.
58-144	#8/2 sub pump wire	$1.95
58-145	#10/2 sub pump wire	$1.50
58-146	#8/3 sub pump wire	$3.25

Cable Lugs & Wire Terminals

Barrel Connectors

These CSA approved connectors are tin plated high strength aluminum alloy. They can be used with copper or aluminum wire. Set screw holds wire into terminal. Single or double barrel connectors .1 Kg.

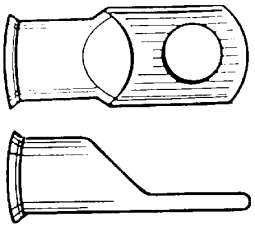
Catalog#	Wire Range	Stud Size	Price
Single Barrel Connectors			
53-831	#2 - #14	1/4"	$2.25
53-832	#2/0 - #14	1/4"	$5.00
53-833	#4/0 - #6	3/8"	$10.75
Double Barrel Connectors			
53-834	#2/0 - #14	1/4"	$9.95
53-836	#4/0 - #6	3/8"	$26.00



CSA Approved Copper Tube Lugs

These lugs are made from tin plated copper tube with 3/8” stud holes. They are lighter than the lugs below, but heavier than standard industrial lugs. They can be soldered or crimped to stranded cable.

Catalog#	Wire Size	Price
59-706	6	$1.45
59-704	4	$1.50
59-702	2	$1.75
59-701	1	$2
59-710	1/0	$2.50
59-720	2/0	$2.75
59-740	4/0	$3.50



Heavy Duty Copper Crimp Lugs

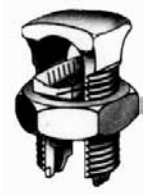
These are super heavy duty tin plated copper lugs with 3/8” stud holes. These can be crimped onto any size cable listed by using a 6” or larger jawed shop vice. These are the highest quality large cable lugs we can find. We recommend covering these with heat shrink tubing after the crimps are made.

Catalog#	Wire Size	Price
59-802	2	$5.00
59-810	1/0	$5.50
59-820	2/0	$6.00
59-840	4/0	$7.00

Split Bolt Connectors

Use these to splice large wires for maximum joining integrity. Cast copper alloy for copper wire only.

Catalog#	Max Wire Size	Price
59-010	#6 AWG	$6.50
59-004	2 AWG	$11.80
59-006	2/0 AWG	$20



Heavy Tinned-Copper Long & Short Barrel Crimp-on Terminals

These tin plated copper wire terminals are designed for a maximum of wire contact length in the crimp-on barrel section for a minimum resistance integrity. Can be easily crimped with a regular hand held tool or crimp in a shop-vice for maximum compression. Use for long lead-in circuits in high amp output PV arrays, wind generators and hydroelectric systems. All terminals have an opening on the lug end of the barrel for soldering the crimped section and wire insert. All terminal sizes come with a choice of barrel lengths: Short-1/2” to 5/8” and Long 5/8” to 7/8”. **These terminals are sold in pairs of two.**

Catalog#	Wire Size	Stud Size	Price Per Pair
59-114	8	1/4”	$5
59-124	8	5/16”	$5
59-138	8	3/8”	$5
59-134	6	1/4”	$5.50
59-146	6	5/16”	$5.50
59-150	6	3/8”	$5.50
59-144	4	1/4”	$6.50
59-148	4	5/16”	$6.50
59-088	4	3/8”	$6.50

Plugs & Receptacles

12 Volt DC Wall Plate Receptacle

This receptacle comes with a chrome plated cover that fits a standard single gang outlet box. This heavy duty outlet is made of brass and steel so it can handle up to 20 amps. The positive connection is a 10-32 threaded stud with nuts. The negative connection of the outlet is connected to the steel cover, so it is a good idea to use a steel junction box with the negative wire connected to the box as well as the negative lead on the outlet.

59-194 Wall Plate Receptacle $8

12 Volt In-Line Receptacle

This cigarette lighter receptacle can handle up to 20 amp of load at 12 volts DC. Wires are 16 gauge 12 inches long.

56-003 In-Line Receptacle Black $9

12 Volt Plug

This heavy-duty plug is made from high heat thermo-set plastic to prevent distortion at high temperatures. It comes with an easy to replace 3 amp glass fuse, but any AGC type fuse up to 15 amps may be used. Wire connections should be soldered. Screw together assembly requires no tools.

56-001 Cigarette Lighter Plug $6

Wall Outlet for 12VDC

This 240 volt, 15 amp receptacle is useful as a unique DC load receptacle which will not be inadvertently confused for 110VAC circuits in the off-grid home. If you have a large power tool it will usually have a 240 volt 20 amp plug on it. The receptacles are duplex (two outlets) and they fit standard wiring boxes and standard duplex receptacle covers. Plugs are available.

52-981 DC/240VDC, 15 amp, Ivory $ n/a
52-982 Plug - Black rubber $ n/a

Switched Wall Receptacle

Some appliances such as a TV, VCR, Microwave oven, stereo and most appliances with built-in clocks are not actually off when not in use. These are `phantom` loads and if powered by an inverter will be parasitically drain your battery bank. We offer these to replace conventional wall switches and unsightly strip-plugs. When the plug is in the off position, no electrical current will flow from the plug in. These are rated at 15 amps AC, or 5 amps DC and fit into a standard wiring box. Available only with an Ivory switch handle.

52-980 Switched Wall Receptacle $ n/a

DC Timer & Switches

Flexcharge™ Real Time Programmable Timer

The Flexcharge™ Real Time Programable Timer is a 24 hr, 8 event ON 8 event OFF, clock based programmable 8A load controller. Multiple Load ON and OFF times are programmed into this real time clock controller. Each day can be programmed with its own unique timing pattern. Eight ON and eight OFF events can be programmed independently. Example; Use one ON event to have a light come on at 7pm every day then use seven different OFF events to turn the light OFF at a different time each day. This controller may be used in conjunction with the Flexcharge NCxxLxx or Night Watchman to have the load come ON at dusk, then shut OFF at a pre-programmed time or turn back on before morning and then OFF at dawn.

Features:
Internal battery maintains clock and programmed memory for up to 3 years with no external power. The battery will not operate the timer.
Consumes less than 5mA in standby mode.
Drives up to 8A Inductive Loads (motors or lights with ballasts) or 16A Resistive Loads.
Isolated relay contacts allow user to directly control up to 240Vac Loads
Reverse Polarity Protected.
Manual override allows the user to manually turn the load ON and OFF as desired.
Easy to Use Terminal Block for simple installation.
Easy programming of timer functions.

52-115	**12V Flexcharge Timer**	**$ 149**

Relays

12 Volt 40 Amp SPDT Relay

These single pole, double throw 40 amp relays are widely used in the automotive industry. Wires may be attached with 1/4" quick connect terminals or order the relay socket below. The socket has 14" wire leads attached. Nominal operating current is 140 mA. Dimensions are 1" x 1" x 1-1/2".

52-205	**40A SPDT Relay**	**$12.00**
52-485	**Relay Socket w/ 14" Lead Wires**	**$ 9.50**

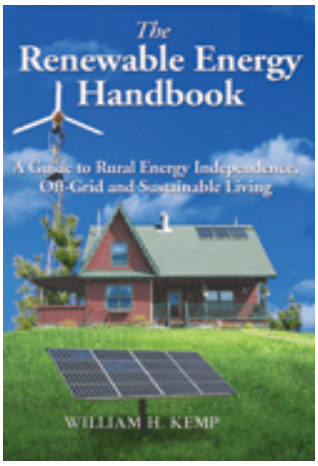
DPDT 30 Amp Relay DPDT 30 Amp Relay

These double-pole double-throw relays can be used for up to 30 amps at 12 or 24 volts DC or 250 volts AC. 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.

Coil Specifications		Catalog #	Price
Voltage	**Current**		
12 VDC	**170 mA**	**52-748**	**$69**
24 VDC	**53 mA**	**52-749**	**$65**
120 VAC	**83 mA**	**52-847**	**$49**
240 VAC	**42 mA**	**52-848**	**$59**

Books / DVD's

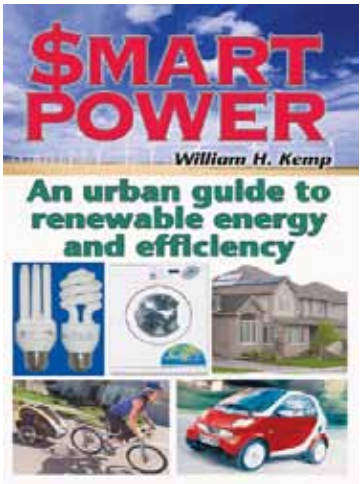
Highly Recommended READING



The Renewable Energy Handbook for Homeowners by William Kemp.

This book is written by a Canadian who understands renewable energy. It is a great investment for the beginner enthusiast or the industry experts. It is an excellent guide for topics on conserving power, producing your own power and understanding how renewable energy can work for you.

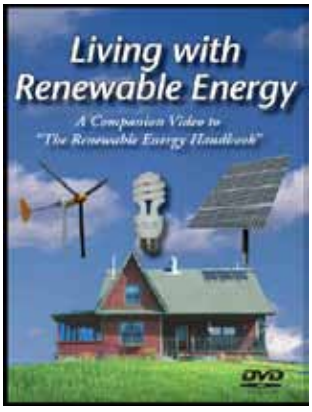
90-900 **$29.95**



Smart Power by William Kemp.

This is the second book written by Canadian William Kemp. Smart Power will help you develop a new relationship with energy that will save money and the environment at the same time.It will help you to be less vulnerable to energy price increases and supply problems.

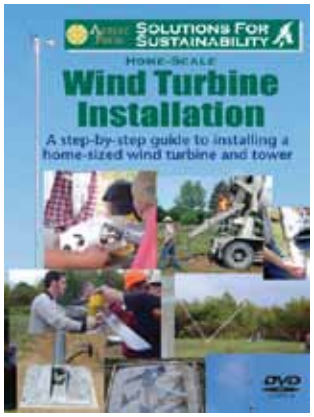
90-901 **$29.95**



Living With Renewable Energy

"Living with Renewable Energy" is the companion DVD to Bill Kemp's best selling "The Renewable Energy Handbook." It gives a guided tour of Bill and Lorraine's off-the-electricity grid home, and shows how normal life can be while using a fraction of the energy of a typical North American home,and generating all your own power from the sun and wind.

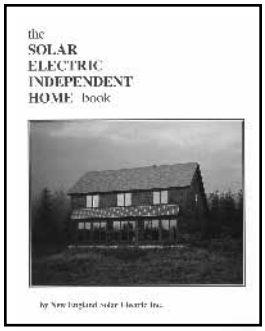
90-801 **$19**



Wind Turbine Installation

This DVD is a step-by-step guide to putting up a home sized wind turbine using a common tubular steel tilt-up tower and winch. Watching this DVD will make that manual that comes with your wind turbine suddenly make sense, and will save you hours of confusion, while offering tips and techniques to make your new wind turbine installation a success. 70 minutes

90-802 **$19**



The Solar Electric Independent Home book by New England Solar Electric Inc. T

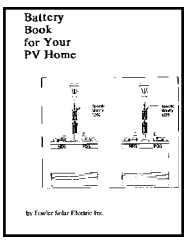
his book is a worthwhile investment for a PV homeowner or potential PV homeowner. It discusses how to site and size a PV system for maximum efficiency. The emphasis is on making efficienct use of power. It is an excellent reference for your electricians.

90-902 **$32**

Battery Book for Your Home by Fowler Electric

This is a good investment for anyone who uses storage batteries. After reading this book, you will understand how a battery works. It explains battery maintenance, equalization and misuse. It will make a large battery investment last longer. 22 Pages.

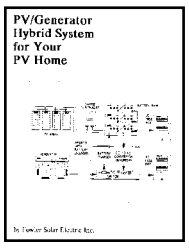
90-135 **$15**



PV/Generator Hybrid System for Your Home by Fowler Electric.

This book gives detailed instructions on wiring your generator to an inverter/charger and using this setup to increase the efficiency of your PV system. It makes specific generator recommendations and discusses lightning protection. 25 pages.

90-136 **$15**



Technical & Wiring Information

Maximum distance in feet of various gauge two conductor copper wire from power source to load for 2% voltage drop in a 12 volt system. Do not exceed the 2% voltage drop for wire between PV modules and batteries. A 4 to 5% loss is acceptable between batteries and lighting circuits in most cases.

Wire Sizes **(Column numbers are distance in feet for wire runs)**

Amps	#14	#12	#10	#8	#6	#4	#2	#1/0	#2/0	#4/0
1	35	70	115	180	290	456	720			
2	22.5	35	57.5	90	145	228	360	580	720	1060
4	10	17.5	27.5	45	72.5	114	180	290	360	980
6	7.5	12	17.5	30	47.5	75	120	193	243	380
8	5.5	8.5	11.5	22.5	35.5	57	90	145	180	290
10	4.5	7	10.5	18	28.5	45.5	72.5	115	145	230
15	3	4.5	7	12	19	30	48	76.5	96	150
20	2	3.5	5.5	9	14.5	22.5	36	57.5	72.5	116
25	1.8	2.8	4.5	7	11.5	18	29	46	58	92
30	1.5	2.4	3.5	6	9.5	15	24	38.5	48.5	77
40			2.8	4.5	7	11.5	18	29	36	56
50			2.3	3.6	5.5	9	14.5	23	29	46
100					2.9	4.6	7.2	11.5	14.5	23
150							4.8	7.7	9.7	15
200							3.6	5.8	7.3	11

Maximum Ampacity for Copper and Aluminum Wire

Wire Size	Copper	Aluminum
14	25	
12	30	25
10	40	35
8	55	45
6	75	60
4	95	75
2	130	100
1	150	115
1/0	170	135
2/0	265	150
4/0	360	205

The electrical code allows rounding up cable ampacity to next standard fuse or breaker.

Recommended Cable, Fuse and Breaker Sizes for Trace Inverters

Trace Model Inverter	Maximum Continuous Amps	Recommended Breaker Size	Recommended Cl. T Fuse Size	Minimum Cable Size
DR1512	160	175	200	1/0
DR1524	80	175	200	1/0
DR2424	128	175	200	1/0
SW2512	275	250*	400	2/0
SW4024	214	250	400	4/0
SW4048	107	175	200	2/0
U2512	267	250*	400	2/0
U2624	139	175	200	2/0
U2548	67	175	200	2/0

* May not allow maximum continuous operation at full power

Use Larger cables for long wire runs

Flow through nozzles in a hydroelectric turbine in Gallons Per Minute at various heads

Nozzle Size-For multiple nozzle turbines, mulriply flow by number of nozzles

Feet	PSI	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1.0"	RPMS For 4" Turbine
5	2.2					6.18	8.40	11.0	17.1	24.7	33.6	43.9	**460**
10	4.3			3.88	6.05	8.75	11.6	15.6	24.2	35.0	47.6	62.1	**650**
15	6.5		2.88	4.76	7.40	10.7	14.6	19.0	29.7	42.8	58.2	76.0	**800**
20	8.7	1.37	3.09	5.49	8.56	12.4	16.8	22.0	34.3	49.4	67.3	87.8	**925**
30	13.0	1.68	3.78	6.72	10.5	15.1	20.6	26.9	42.0	60.5	82.4	107	**1140**
40	17.3	1.94	4.37	7.76	12.1	17.5	23.8	31.1	48.5	69.9	95.1	124	**1310**
50	21.7	2.17	4.88	8.68	13.6	19.5	26.6	34.7	54.3	78.1	106	139	**1470**
60	26.0	2.38	5.35	9.51	14.8	21.4	29.1	38.0	59.4	85.6	117	152	**1600**
80	34.6	2.75	6.18	11.0	17.1	24.7	33.6	43.9	68.6	98.8	135	176	**1850**
100	43.3	3.07	6.91	12.3	19.2	27.6	37.6	49.1	76.7	111	150	196	**2070**
120	52.0	3.36	7.56	13.4	21.0	30.3	41.2	53.8	84.1	121	165	215	**2270**
150	65.0	3.76	8.95	15.0	23.5	33.8	46.0	60.1	93.9	135	184	241	**2540**
200	86.6	4.34	9.77	17.4	27.1	39.1	53.2	69.4	109	156	213	278	**2930**
250	108	4.86	10.9	19.9	30.3	43.6	59.4	77.6	121	175	238	311	**3270**
300	131	5.32	12.0	21.3	33.2	47.8	65.1	85.1	133	191	261	340	**3590**
400	173	6.14	13.8	24.5	38.3	55.2	75.2	98.2	154	221	301	393	**4140**

Glossary: compliments of Xantrex

Absorption Charge—The second stage of three-stage battery charging. Voltage remains constant and current tapers as internal battery resistance increases during charging. (Ensures complete charging.)

Alternating Current (AC)—The type of electrical power supplied by utilities or made when a generator is run. The unique characteristic of this form of electricity is that it reverses direction at regular intervals. For example, 120 Vac 60 Hz. power reverses flow 60 times per second, hence the rating 60 Hz. (cycles).

Amp—A measurement of the flow of electrical current. One amp is equal to the electric force of one volt acting across the resistance of one ohm.

Amp Hour—One amp hour of electrical current flowing for one hour. Expresses the relationship between current (amps) and time. (OHMS law: A=V/R)

Array—A group or groups (sub-arrays) of solar electric modules wired together.

Sub-Array—One group of solar electric modules wired together and form part of a total array.

Bulk Charge—The first stage of three-stage battery charging. Current is sent to batteries at the maximum rate they accept while voltage rises to full charge level.

Current—The rate of flow of electrical charge. The flow of amps is often expressed as current.

Direct Current (DC)—Tis type of electricity can be stored in batteries. It is produced by solar electric devices and from other battery charging sources. Current flows in one direction only.

Electrolyte—A conductive medium in which the flow of electricity takes place; this is the fluid found inside storage batteries.

Float Charge—The third stage of three-stage battery charging. After batteries reach full charge, charging voltage is reduced to a lower level to reduce gassing (boiling of electrolyte) and prolong battery life. This is often referred to as a maintenance charge, since rather than charging a battery it keeps an already-charged battery from self-discharging.

Grid—When used in reference to utility power, it refers to a system of electrical transmission and distribution lines.

Ground Fault Protection (GFP)—A electrical circuit protection device that prevents the flow of electrical current to earth if a short circuit is present. Usually required in wet locations—e.g. for outdoor, kitchen and bathroom circuits.

Hertz (Hz)—The frequency, or number of times per second, that the flow of AC electricity reverses itself. Also referred to as cycles (see alternating current).

High Battery Protection—A control circuit that disconnects charge current flowing to a battery(s) when voltage reaches a dangerously high threshold. Prevents damage created by excess gassing (or boiling) of the battery electrolyte.

Hydrometer—A simple device that measures the specific gravity of the liquid electrolyte inside a battery cell. Specific gravity readings express state of charge / discharge of a battery.

Idle Current—The amount of electrical power required to keep an inverter ready to produce electricity on demand

Kilowatt (kW)—One thousand watts of electricity. Ten 100-watt light bulbs use one kilowatt of electrical power.

Kilowatt hour (kW/h—One kW of electrical power used for one hour. The most common measurement of electrical consumption, most grid connected electrical meters measure kW/h for billing purposes.

Light Emitting Diode (LED)—A device used to display various status functions on electrical meters.

Line Loss—A voltage drop caused by resistance in wire during transmission of electrical power over distance.

Line-tie—An electrical system that is connected to a utility distribution grid. For example, Trace Engineering`s SW line-tie inverters are designed to and interact with utility power.

Load—Any device that consumes electricity in order to operate. Appliances, tools and lights are examples of electrical loads.

Low Battery Protection—A control circuit that stops the flow of electricity from batteries to loads when battery voltage drops to dangerously low levels.

Maximum Power Point Tracking (MPPT)—Every PV (solar electric) device has a point where maximum current is delivered. MPPT electronically adjusts the output of a PV-device to the maximum power point. This is the function of a Linear Current Booster (LCB).

Modified Sine Wave—An AC wave form (generated by many inverters) that is a pulse width modified square wave. It consists of a number of very small on/off steps rather than a fully smooth wave.

Canadian National Electrical Code—A consistent set of electrical wiring and installation standards used in Canada.

Off Grid—An electrical system that is not connected to a utility distribution grid.

Oscilloscope—A device that displays the wave form created by an electrical generating device such as a generator, inverter or utility.

Overload/Overcurrent Protection—A control circuit designed to protect a similar device from loads exceeding its output capacity. (A fuse, for example, is an overcurrent protection device.) Another example: All Trace Engineering inverters have internal protection circuitry to protect themselves from overload/overcurrent conditions.

Parallel Wiring—A group of electrical devices, such as batteries or PV modules, wired together to increase ampacity, while voltage remains constant. (Two 100 amp hour 12 Vdc batteries wired in parallel will form a 200 amp-hour 12 Vdc battery bank.)

Photovoltaic System—The components that form a solar electric generating system, usually consisting of PV modules, charge controller, circuit protectors (fuses or breakers) and batteries.

Series Wiring—A group of electrical devices, such as batteries or PV modules, wired together to increase voltage, while ampacity remains constant. (Two 100 amp hour 12 Vdc batteries wired in series form a 100 amp hour 24 Vdc battery bank.)

Sine Wave—The output wave form of an electric generator or utility. A smooth wave going above and below zero is created. This wave form is also produced by sine wave inverters such as the Trace Engineering SW and Co-Sine series.

Surge Capacity—The amount of electrical current an inverter can deliver for short periods of time. Most electric motors draw up to three times their rated current when starting. An inverter will “surge” to meet these motor-starting requirements. Many of today`s inverters have surge capacities at least three times their continuous ratings.

Transfer Switch—A switch designed to transfer electricity being supplied to a load (appliances etc.) from one source of power to another. A transfer switch may be used to designate whether power to a distribution panel will come from a generator or inverter.

Volts—A unit of measure of the pressure (motive force) in an electrical circuit. Volts are a measure of electric potential. Voltage is often explained using a liquid analogy—comparing water pressure to voltage: a high pressure hose would be considered high voltage, while a slow-moving stream could be compared to low voltage.

Watt(s)—A quantitative measurement of electrical power. Watts are calculated by multiplying volts times amps. Using a liquid analogy, watts are similar to liquid flow such as litres or gallons. (watts = volts x amps)

Watt Hour (w/H)—Electrical power measured in terms of time. One watt hour of electricity is equal to one watt of power being consumed for one hour. (A one-watt light operated for one hour would consume one watt hour of electricity.)