

1994



SOLECTRIA

THE LEADER IN ELECTRIC VEHICLE TECHNOLOGY

ELECTRIC VEHICLE COMPONENTS



Dear Valued Customer:

In the 1990's, electric vehicle technology is coming of age. Solectria is proud to be a world leader in the design and manufacture of state-of-the-art electric vehicle components.

Our philosophy is simple: State-of-the-art does not mean experimental. Every component we offer in this catalog has passed rigorous road testing and is guaranteed to perform. In fact, Solectria drive systems have successfully logged hundreds of thousands of miles of real-life driving conditions around the world.

Since 1986, our products have been used with resounding success in research, racing, commuting, and fleet operations. On the U.S. racing circuit, vehicles relying on Solectria components consistently dominate the major solar, electric, and hybrid vehicle competitions.

For commuter vehicles and fleet use, Solectria offers a wide range of high-performance, light-weight, drive systems and accessories. Our electric sedan, the Force, and our electric pickup, the E10, have earned an enviable reputation for exceptionally efficient and reliable service.

The unique international partnership we have established with electric vehicle development teams, utilities, and government agencies has come about as a result of Solectria's orientation as an applied technology company. Our goal is to take advanced technology from the lab and put it on the road.

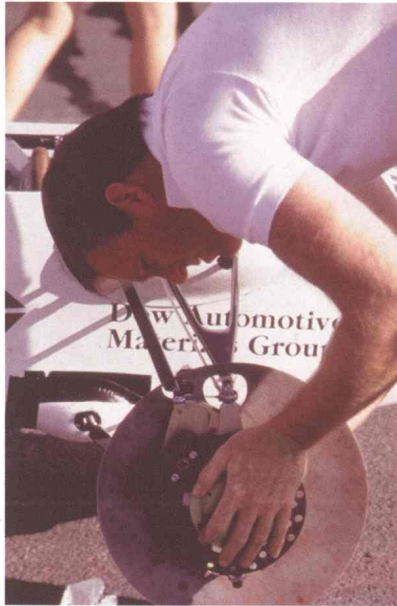
We look forward to working with you in developing your own applications as together we make practical, effective electric transportation a reality!

A handwritten signature in black ink, appearing to read "James Worden", with a long horizontal flourish extending to the right.

James Worden, CEO/Director R&D



Anita Rajan, President



AC Induction Motors & Controllers.....	4, 5
Brushless PM Motors & Controllers.....	6, 7
DC Brush PM Motors and Controllers.....	8
Gearboxes.....	9
Battery Chargers.....	9
DC-DC Converters, 12 V Output.....	10
Maximum Power Trackers (MPT).....	10
Gauges.....	10
(Ampere-Hour Meters, Voltmeters, Ammeters)	
Connectors.....	11
Switches.....	11
Accelerator/Brake Controller.....	11
Fans and Blowers.....	11

CONTENTS



Photo Credits:

Page 4 (CARTA bus) courtesy Electric Transit Vehicle Institute/AVS.

Page 9 (110 outlet), page 11 (under hood), courtesy of Virginia Power Company.

Other photography courtesy Sam Ogden Photography.

High-Efficiency AC Induction

These highly efficient AC Induction drive systems offer superior torque at low motor speeds and the greatest efficiency over a wide range of motor speeds. They involve fewer parts, need less cooling, and offer greater efficiency and reliability than other types of drive systems.

Features include an "electronic transmission" which eliminates the need for a multi-speed gearbox. These motors may be attached directly to the vehicle's wheel(s) with a direct fixed ratio, and will provide high torque at low motor speeds for hill climbing and rapid acceleration. Maximum torque is available up to nominal speeds, and though torque decreases as motor speed rises, adequate torque is produced for highway cruising.

Motor features:

- No brushes or magnets
- Sealed motor
- Compact design
- Ultra-low rotating loss
- Very low electrical resistance
- Low cost/high reliability

Controller features:

- Smooth, powerful regenerative braking
- Overload protection
- High peak power capacity
- Outputs can display battery voltage and current, speed and distance traveled
- Current-limited
- Compact design
- Torque controlled for smoothest driving response



AC12

ACgtx20

AC30

AC INDUCTION MOTORS

Specifications	AC12	ACgtx20	AC30
Nominal power	4 kW	7 kW	8 kW
Max. power w/AC200 (144 V)	14 kW	14 kW	14 kW
Max. power w/AC300 (144 V)	--	21 kW	21 kW
Max. power w/AC300-216V (216 V)	--	28 kW	28 kW
Nominal torque	12 Nm	20 Nm	30 Nm
Max. torque w/AC200 (144 V)	35 Nm	45 Nm	55 Nm
Max. torque w/AC300 (144 V)	--	55 Nm	70 Nm
Nominal speed	4,000 rpm	4,000 rpm	3,000 rpm
Maximum speed	12,000 rpm	12,000 rpm	9,500 rpm
Weight	51 lb.	66 lb.	93 lb.

Single-motor 144V systems range from 18-28 HP, dual motor systems 36-56 HP. Single-motor 216V systems range from 18-34 HP, dual motor systems 56-68 HP. Other system voltages and drive configurations are available; ask for assistance.

Applications

These motor and controller designs are particularly suited to commuter automobiles, trucks, buses and shuttles, industrial plant vehicles, airport service vehicles, and other applications where low-speed torque is an important requirement.

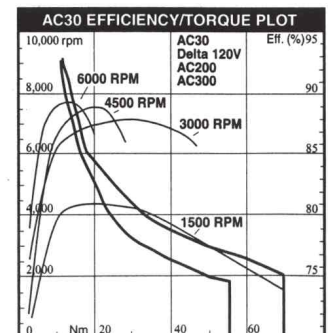
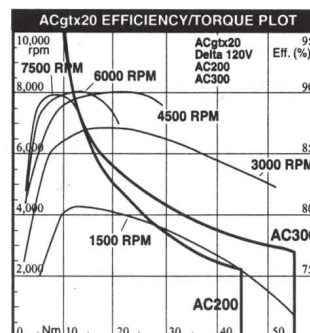
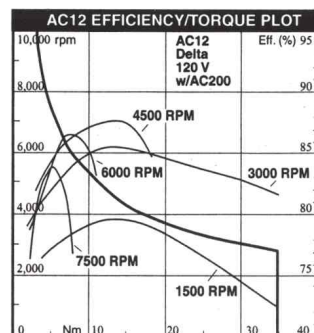
Maximum torque is available up to nominal speed, and decreases as speed approaches maximum speed (see graphs for details).

For higher-power systems, see table on Dual Drive Configurations (right).

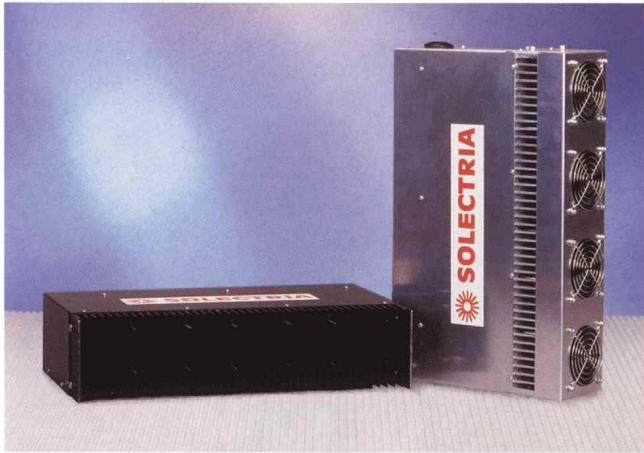


Solectria AC induction motors and controllers are ideal in applications where low-speed torque is important.

MOTOR AND CONTROLLER EFFICIENCY GRAPHS



Motors and Controllers



AC200

AC300

AC INDUCTION MOTOR CONTROLLERS

Specifications	AC200	AC300	AC300-216V
Maximum power	14 kW	21 kW	28 kW
Nominal voltage	96-144 V	96-144 V	180-216 V
Safe operating range	70-170 V	70-170 V	150-260 V
Max. motor current (phase)	150 A	210 A	180 A
Max. battery current	100 A	160 A	140 A
Efficiency @ nominal power	98%	98%	98%
Efficiency @ full load	95%	96%	95%
Power for circuit electronics	12 W	12 W	12 W
Weight	19 lb.	20 lb.	20 lb.
Dimensions	17" x 9" x 4"	17" x 9" x 4"	17" x 9" x 4"
Operating temperature	-20 to +85°C	-20 to +85°C	-20 to +85°C

Delta(Δ)-Wye(Y) switching allows higher peak torques (by a factor of about 1.7). Note, however, that peak torque given for Wye operation will be available only for the first 58% of the nominal Delta speed.

The Wye winding configuration, which offers maximum torque, is not the most efficient mode of operation and should be used for short durations (fast acceleration, hill

climbing). With a switch in the vehicle, you can "shift" while moving. See listing on Δ-Y switch, page 11.

Performance of one ACgtx20 and one AC300 in a 2,000 lb. car: 0-30 mph in 8 sec., top speed 60 mph, ratio 12:1.

Dual-Drive Configurations

Peak Torque and Peak Power

Two AC200 Controllers

Motor Type	Nm	kW	HP
2 x AC12 (Δ)	2 x 35	28	36
2 x ACgtx20 (Δ)	2 x 45	28	36
2 x AC30 (Δ)	2 x 55	28	36

Two AC300 Controllers

2 x ACgtx20 (Δ)	2 x 55	42	56
2 x AC30 (Δ)	2 x 70	42	56

Two AC300-216V Controllers

2 x ACgtx20 (Δ)	2 x 50	56	68
2 x AC30 (Δ)	2 x 64	56	68

Delta-Wye Configurations

Peak Torque(Nm)

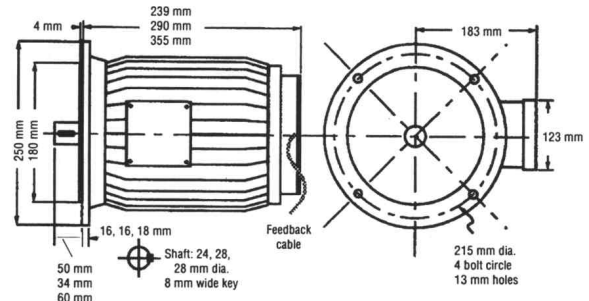
One AC200 Controller

	Wye (Y)	Delta (Δ)
AC12	--	35
2 x AC12	2 x 30	2 x 20
ACgtx20	65	45
AC30	70	55

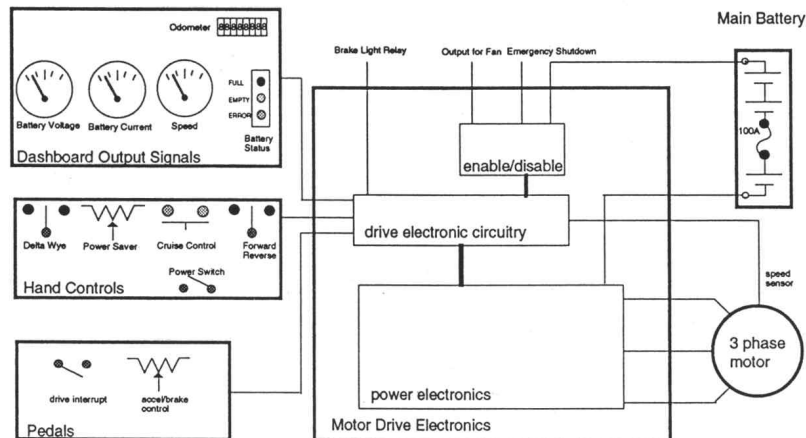
One AC300 Controller

2 x AC12	2 x 40	2 x 28
2 x ACgtx20	2 x 45	2 x 28
ACgtx20	--	55
AC30	95	70

Where multiple dimensions are shown, each applies to the models AC12, ACgtx20, and AC30 respectively.



AC Motor Controller Schematic



CONVERSION UNITS

P = Mechanical power out
 $P = (Nm) \times (\pi \text{ rad./sec.}) = \text{Watts}$
 $\pi \text{ rad./sec.} = 0.105 \times \text{rpm}$
 $\text{Watts} = Nm \times 0.105 \times \text{rpm}$
 $1 \text{ ft.-lb.} = 1.357 \text{ Nm}$
 $1 \text{ HP} = 746 \text{ Watts} = 550 \text{ ft.-lb./sec.}$

Brushless Permanent Magnet

The brushless permanent magnet motor drive system is the industry's ultimate in power, efficiency, reliability, and minimized weight. This drive system technology has been utilized in more competition-winning vehicles than any other type of drive system.

Solectria's brushless PM motors use rare earth magnets (Neodymium Iron Boron) for maximum power density. Windings are in direct contact with the outside housing of the motor, resulting in optimal cooling. Another benefit of this design is that it provides maximum room for the windings, thus lowering the internal electrical resistance.

Motor features:

- Highest efficiency
- No brushes
- Sealed motor
- Compact design
- Low rotating loss
- Very low electrical resistance
- Efficient cooling
- Best power-to-weight design

Controller features:

- Current-controlled stepless regenerative braking
- Very good torque-to-weight ratio
- Simple connection and operation
- Series/parallel switch available
- High continuous power and efficiency in broad operating range
- Current-limited
- Compact design



More Solectria drive systems are used in competition-winning race cars than those of any other manufacturer.



BRLS8

BRLS11

BRLS16

BRUSHLESS PERMANENT MAGNET MOTORS

Specifications	BRLS8	BRLS11	BRLS16
Continuous power output	6 kW (8 HP)	8 kW (11 HP)	12 kW (16 HP)
Peak power output	15 HP	20 HP	30 HP
Nominal voltage*	60/120 V	120 V	144 V
Continuous stall current	140/70 A	100 A	120 A
Peak current	280/140 A	200 A	240 A
Continuous stall torque	12 Nm	17 Nm	28 Nm
Peak torque	25 Nm	32 Nm	56 Nm
Peak motor efficiency**	95 %	95 %	94 %
Operating speed	6,000 rpm	7,000 rpm	5,000 rpm
Winding resistance	0.021/0.085 Ω	0.050 Ω	0.012 Ω
Weight	26 lb.	32 lb.	64 lb.
Operating temperature	-20 to 85°C	-20 to 85°C	-20 to 85°C

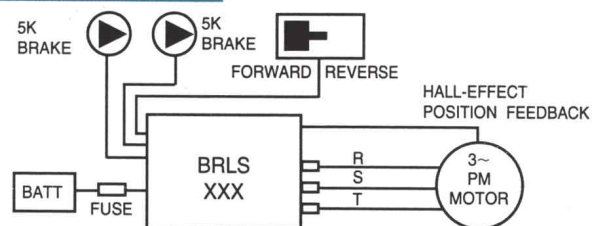
* Many other voltage windings available.

** The BRLS8 can be optimized for higher efficiency at low power (2-3 HP).

To double the torque of the motor, a two-speed switch can be used. This switch system involves two windings which are placed in series for first speed and in parallel for second speed. The first speed allows twice the torque to be produced with the same current from the controller.

Motor voltage, speed, and direction of rotation are built to user's specifications.

System Schematic



Two accelerator/brake controllers (ABC1) are recommended for use as the 5k potentiometers.

CONVERSION UNITS

P = Mechanical power out
 $P = (\text{Nm}) \times (\pi \text{ rad./sec.}) = \text{Watts}$
 $\pi \text{ rad./sec.} = 0.105 \times \text{rpm}$
 $\text{Watts} = \text{Nm} \times 0.105 \times \text{rpm}$
 $1 \text{ ft.-lb.} = 1.357 \text{ Nm}$
 $1 \text{ HP} = 746 \text{ Watts} = 550 \text{ ft.-lb./sec.}$

t Motors and Controllers



BRLS150

BRLS250

BRLS100H

BRLS240H

These controllers are equipped with a connection for a "gas pedal/throttle" potentiometer, which allows the driver to control the current delivered to the motor, and a "brake pedal" potentiometer which controls current from the motor to the battery (in regen mode). A suitable accelerator/braking control unit is Solectria's Model ABC1, listed under "Accessories".

The controllers also have hall-effect feedback for accurate motor positioning, and use variable frequency pulse width modulation to control the speed of the motor.

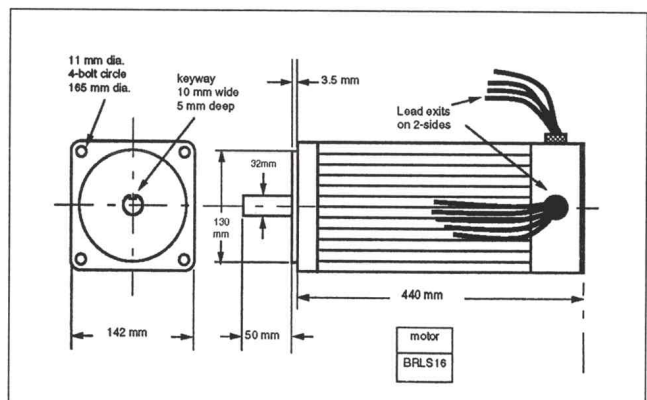
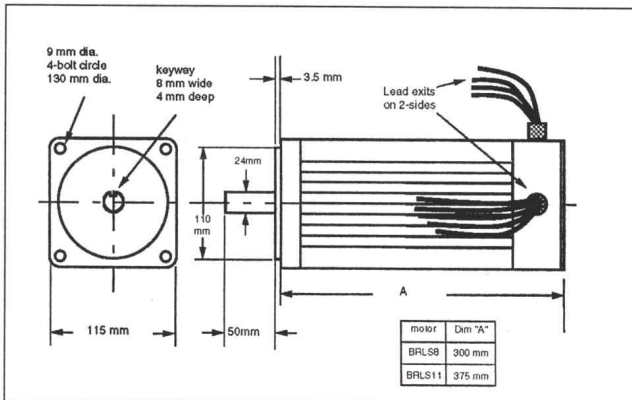
This design incorporates power MOSFETs rather than SCRs in order to boost efficiency and reliability.

Applications:

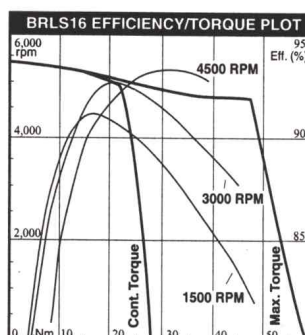
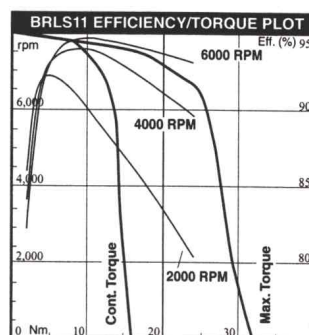
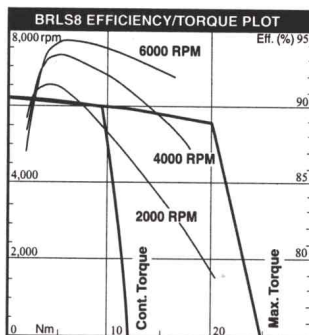
These motor and controller designs are particularly suited to use in solar and electric racing cars, high-performance vehicles, hybrid vehicles and advanced HVAC systems.

BRUSHLESS PERMANENT MAGNET MOTOR CONTROLLERS

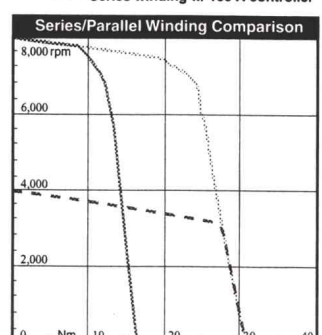
Specifications	BRLS150	BRLS250	BRLS100H	BRLS240H
Nominal voltage	48-72 V	48-72 V	80-120 V	80-144 V
Safe operating range	40-85 V	40-85 V	60-170 V	60-170 V
Max. motor current	150 A	220 A	100 A	220 A
Efficiency	94-99 %	94-99 %	94-99 %	94-99 %
Power for circuit electronics	6-8 W	6-8 W	6-8 W	6-8 W
Weight	12 lb.	15 lb.	12 lb.	17 lb.
Dimensions	12" x 8" x 5"	12" x 8" x 5"	12" x 8" x 5"	17" x 8" x 5"
Operating temperature	-20 to +75°C	-20 to +75°C	-20 to +75°C	-20 to +75°C



MOTOR AND CONTROLLER EFFICIENCY GRAPHS



..... Parallel winding w/200 A controller
 ——— Parallel winding w/100 A controller
 - - - Series winding w/ 100 A controller



DC Brush Permanent Magnet Motors and Controllers



BPM3/BPM6/BPM8

The Models BPM3, BPM6 and BPM8 are permanent magnet motors which provide cost-effective, efficient power for accessory systems and light-weight vehicle drive systems.

DC200/DC100H/DC20

DC200 and DC100H controllers serve dual functions, operating as electronic transmissions and torque regulators.

The DC20 is designed for use as an air compressor motor controller with 12 V control wires. (No regen)

These DC brush motors with permanent magnets are highly efficient and reliable, compact and light-weight, and have a high power-to-weight ratio. They represent an affordable choice for vehicle compressor systems, power brakes, power steering, air conditioning systems, and will also power light-weight solar and electric vehicles.

These controllers are the best solution for DC brush motors with either wound or permanent magnet fields. Using the motor's inductance, the controllers efficiently boost the current coming out of the battery with a subsequent voltage drop (at the motor's terminals). The best overall efficiency is used to drive an efficient brush permanent magnet motor.

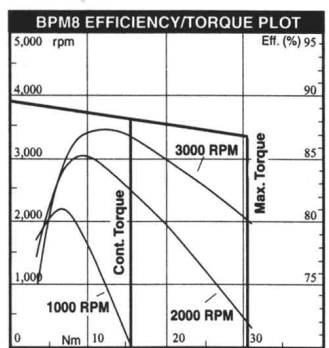
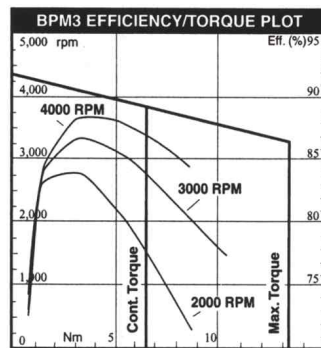
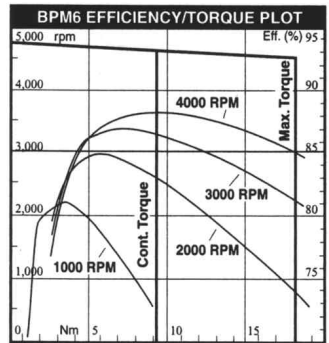
Acting as a transmission, it allows a variable amount of torque to be

delivered to the wheel. The unit is equipped with highly reliable power MOSFETS which are switched at up to 20 kHz, and comes standard with regenerative braking (except DC20).

In operation, the controller uses two potentiometers, one for the "accelerator" and one for the regenerative brakes. The system is protected in case both pots are activated. It is equipped with a low-battery voltage shut-down and overvoltage protection. Regen braking occurs automatically whenever the motor voltage exceeds the battery voltage. Maximum battery and motor currents as well as low-voltage shut-down are pre-set before shipment.

CONVERSION UNITS

$P = \text{Mechanical power out}$
 $P = (\text{Nm}) \times (\pi \text{ rad./sec.}) = \text{Watts}$
 $\pi \text{ rad./sec.} = 0.105 \times \text{rpm}$
 $\text{Watts} = \text{Nm} \times 0.105 \times \text{rpm}$
 $1 \text{ ft.-lb.} = 1.357 \text{ Nm}$
 $1 \text{ HP} = 746 \text{ Watts} = 550 \text{ ft.-lb./sec.}$



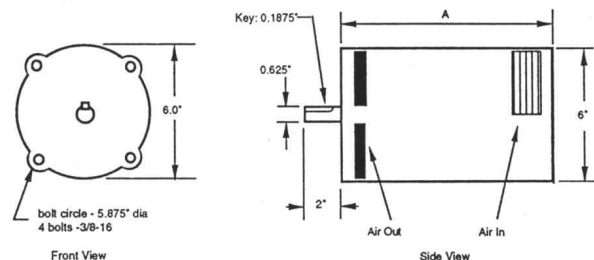
Motor Specifications	BPM3	BPM6	BPM8
Continuous power output	3 HP/2240W	6 HP/4480W	8.5 HP/6340W
Nominal voltage	72 V	60 V	120 V
Continuous current	40 A	80 A	54 A
Intermittent current	80 A	160 A	100 A
Continuous torque	6.6 Nm	9.5 Nm	16 Nm
Maximum torque	13.5 Nm	18.3 Nm	30.4 Nm
Peak motor efficiency	85 %	88 %	89 %
Operating speed	4,000 rpm	4,500 rpm	3,800 rpm
Winding resistance	0.18 Ω	0.03 Ω	0.13 Ω
Weight	24 lb.	39 lb.	54 lb.

Other nominal voltages are available. Motor curves are in conjunction with 25 CFM fan.

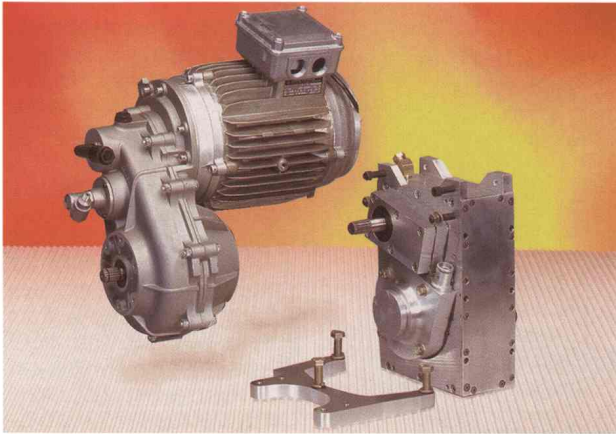
Controller Specifications	DC200	DC100H	DC20(non-regen)
Maximum motor current	200 A	100 A	20 A
Max. battery current	160 A	80 A	20 A
On-resistance	5 mΩ	10 mΩ	42 mΩ
Minimum battery voltage	25 V	75 V	50 V
Maximum battery voltage	75 V	150 V	450 V
Weight	4 lb.	4 lb.	2.5 lb.
Dimensions	8" x 5" x 4.5"	8" x 5" x 4.5"	7" x 5" x 2.5"
Controller circuit current	10 mA	10 mA	6 mA
PWM frequency	20 kHz	20 kHz	20 kHz

DC Brush Motor Diagram

MODEL	Dim. A
BPM3	10.25"
BPM6	13.5"
BPM8	14.25"



Gearboxes



AT600

Integrated gearbox with ACgtx20 motor. 10:1 ratio, 96 lb. including motor.

AT1000-2

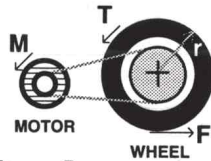
Lightweight, compact gearbox with easy mounting of one or two motors. 5:1 – 8:1, 29.5 lb., 10" x 7" x 4", 25mm input shaft.

AT1000-3

Higher ratio gearbox. 8:1 – 13:1, 31.4 lb., 10" x 7" x 4", 20mm input shaft.

Solectria has designed high-efficiency, lightweight, compact single-speed gearboxes specially for use in electric cars. These units contain a built-in differential. The AT600 includes an AC Induction motor. The AT1000-2 and AT1000-3 are designed to be used with AC Induction, Brush PM and Brushless PM motors. Motor mounting plates are available once a ratio is specified.

Determining torque requirements, gear ratios and vehicle speeds



Force = F
 Overall gear ratio: N
 Motor torque: M
 Wheel torque: T
 Outside tire radius: r

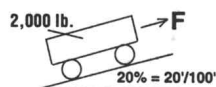
Torque = force x radius
 $(T = F \times r)$

Motor torque x overall ratio = wheel torque ($M \times N = T$)

$\frac{\text{wheel torque}}{\text{wheel radius}} = \text{force on car}$

$$\left(\frac{T}{r}\right) = F$$

To determine the ratio needed to climb a grade based on peak motor torque:



Example: 20% grade, 2,000 lb. vehicle with 22" tire diameter ($r = 0.92$ ft.) using the ACgtx20 AC Induction motor.

$F = \% \text{ grade} \times \text{car weight}$
 $F = 0.20 \times 2,000 \text{ lb.} = 400 \text{ lb.}$
 $F \times r = T; 400 \text{ lb.} \times 0.92 \text{ ft.} = 368 \text{ ft.-lb.}$
 $M \times N = T; (M \sim 33 \text{ ft.-lb. for ACgtx20})$
 $368 \text{ ft.-lb.} \div 33 \text{ ft.-lb.} = 11.2:1 \text{ ratio}$

To calculate horsepower: At 50 mph, tire speed is 758 rpm, and with 11.2:1 ratio, motor speed is 8485 rpm. At 8485 rpm, the ACgtx20 motor has a maximum torque of 8.84 ft.-lb., therefore 99 ft.-lb. at the wheels.

Motor power is defined as:
 $P = \text{Torque} \times \text{Speed}^*$
 $P = 8.84 \text{ ft.-lb.} \times 891 \pi \text{ rad./sec.}^*$
 $= 7876 \text{ ft.-lb./sec.} = 14.3 \text{ HP}$
 $^* \text{Speed} = \pi \text{ rad./sec.} = .105 \times \text{rpm}$

Battery Chargers



BC1000

Charger with pre-set current and voltage limits.

BC2000

Charger with pre-set voltage and manually adjustable current limits.

BC3000

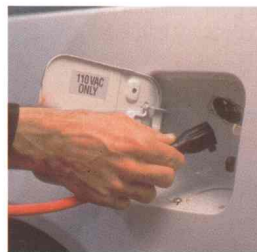
Similar to BC2000, with higher wattage and amperage.

These compact, lightweight, highly-efficient chargers are designed specifically for solar and electric (or hybrid) vehicles. A sophisticated high-frequency transformer gives 100% isolation for safety. Chargers may be easily mounted on-board or carried for off-board charging.

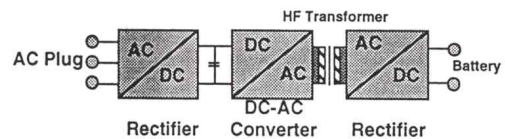
They use a standard 110 VAC or 220 VAC cord for input, and a two-conductor cord for output (battery bus).

All chargers are fully automatic, and are factory pre-set to suit optimal charging topology required for all types of lead-acid batteries as well as nickel-cadmium and others. They can be shut off immediately after reaching the voltage limit, or can be set to overcharge for a specific period and subsequently shut off (ideal for nickel-cadmium batteries).

The 110 VAC BC1000 can be used in parallel (multiple BC1000's) to achieve greater power output.



Schematic Diagram



Specifications	BC1000	BC2000	BC3000
Input voltage (V_{in})	110 VAC/220 VAC	220 VAC	220 VAC
Power output @ V_{in}	900 W	2,000 W	3,000 W
(Max. power @ 240 VAC)	1,000 W	2,400 W	3,600 W
Output voltage (V_{out})	100-270 VDC	100-270 VDC	100-270 VDC
Voltage limit is pre-set to your specs			
Current (max.)	0-7 A	0-15 A	0-24 A
Current limit	Pre-set for application		
Efficiency	91-92 %	93-94 %	93-94 %
Weight	9 lb.	12 lb.	14.5 lb.
Size	9" x 12.25" x 3"	9.75" x 12" x 7"	9.75" x 12" x 7"

DC-DC Converter, 12V Output



DC-DC100 / DC-DC200 DC-DC380 / DC-DC750

- Compact design
- Very low idling power
- Input-output isolation
- Built-in overload protection

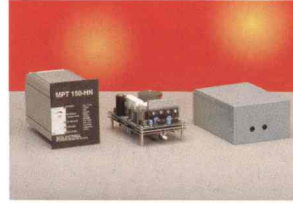
Our DC-DC converters enable the use of 12 V accessories in your solar and electric vehicles, such as a horn, turn signals, parking and brake lights, gauges, headlights, computer equipment, even cellular phones!

These highly efficient lightweight modular converters hold output voltage constant with large changes in load. (They are not designed to charge batteries—other devices are available.)

Please specify input voltages when ordering your converter. Special output voltages are available upon request.

Specification	DC-DC100	DC-DC200	DC-DC380	DC-DC750
Output voltage (tunable at factory to ±10%)	12 VDC	12 VDC	12 VDC	12 VDC
Input supply voltage	20-190 V	20-190 V	50-380 V	50-380 V
Efficiency	80-90 %	80-90 %	80-90 %	80-90 %
Weight	8 oz.	8 oz.	2.5 lb.	4 lb.
Size	5" x 2.5" x 1"	5" x 2.5" x 1"	2" x 5" x 7"	2" x 10" x 7"
Power	100 W	200 W	380 W	750 W

Maximum Power Tracker (MPT)



The power output of solar cells varies constantly with changing light and temperature. The MPT keeps the solar array voltage tuned to assure the greatest power output.

The MPT is constructed as a boost converter. The solar input voltage should be at least 5% lower than the output to the battery. The unit also helps prevent battery damage from overcharging, and when input voltage drops too low, the unit disconnects the array to prevent battery discharge.

- 99% efficiency
- Fully automatic operation
- Auto shut-down
- Fast response
- Low standby power consumption
- Compact and reliable

Specifications	MPT150N	MPT150HN
Minimum solar voltage	9 V	9 V
Maximum solar voltage	170 V	170 V
Maximum solar current	6 A	15 A
Maximum battery voltage	180 V	180 V
Maximum efficiency	99%	99%
Maximum tracking time	50 ms	50 ms
Circuit power	0.8 W	0.8 W
Size	6.4" x 2.9" x 3.9"	6.7" x 3.7" x 4.2"
Weight	1.8 lb. (case is available)	3.3 lb. (cased)

Gauges: Ampere-Hour Meter, Voltmeter, Ammeters



AMP-HOUR METER AH100 / SHUNT SH100

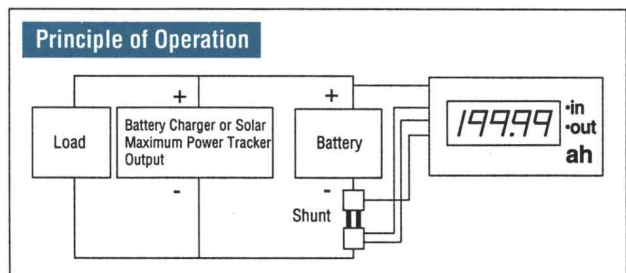
When charging the battery, the meter counts down (or negative), and when discharging the battery, the meter counts up (or positive). It records energy taken from the battery and amp-hours replaced by solar or grid charging, or by regenerative braking. The unit helps the driver keep track of the battery charge state and is a highly precise "fuel gauge". If charged below zero (negative) in its preset condition, the meter resets to zero as soon as the battery begins to be discharged. This is the auto-zeroing feature.

A very low-resistance shunt (100 A, 60 mV) is used to give the meter the instantaneous current signal that the meter then integrates over time and displays on the LCD readout. The shunt can handle double its rated current for short periods of time.

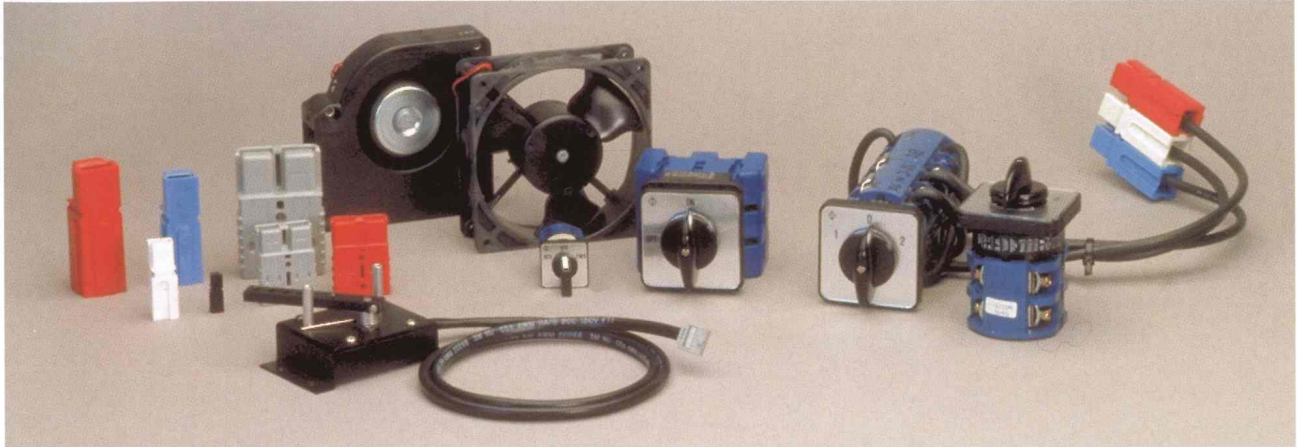
The SH200 (200 A, 60 mV) can be used for applications above 200 A. The subsequent readout will be 50% of the actual amp-hours used.

Outputs are available for data acquisition. Features include manual reset and backlighting.

Specifications	AH100 Amp-hour meter
Min. to max ampere capability (w/ SH100)	0.01-250 A
Ampere measuring accuracy	0.02 %
Measuring range	-199.99 to +199.99 Ah
Max. overall error (including shunt)	1 %
Power supply voltage (battery)	10-300 V
Power usage	0.06 W
Size	1.9" x 3.8" x 4.5"
Mounting hole	1.7" x 3.62"
Shunt resistance (SH100-100A)	6 mΩ
Weight	0.55 lb.
LCD backlight for nighttime viewing	
Watt-hour version available	
SH60 Shunt	60 A, 60 mV
SH100 Shunt	100 A, 60 mV (ideal for AH100)
SH200 Shunt	200 A, 60 mV (for high current applications with AH100)
VOLT200 Voltmeter	100 V to 200V
AMP150 Ammeter	-50 A to +150 A, calibrated for use with SH100
AMP300 Ammeter	-100 A to +300 A, calibrated for use with SH100 or SH200



Accessories



Switches

Standard lightweight switches rated at 80 A and 125 A continuous. Applications include:

- Main battery switch
- DC motor forward/reverse switch
- Series/parallel switch for BRLS motors
- Delta/Wye switches for AC Induction motors

Switches are available in 2-, 3-, and 6-pole, single or double throw, with or without neutral.

Connectors

The connectors, which come in various sizes, are simple to use and will enhance safe handling of battery, motor, and controller cables.

- Interlockable single-pin connectors rated at 15 A, 50 A, 120 A, 175 A, and 200 A continuous. They are available in red, white and blue for coding
- Two-pole battery connectors rated at 50 A and 175 A, in red and grey

Accelerator/ Brake Controller

ABC1

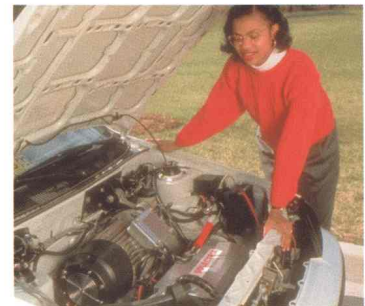
The ABC1 functions as a safe, reliable throttle control for all motor controllers, with a simple interface to mechanical pedals. This lightweight lever action 5k Ω potentiometer with spring return allows full travel of a pot within a 60° displacement. With a size of 2-3/8" x 4" x 2", and weighing only 4.4 oz., it is essential for any complete EV system. Use one for the accelerator and one for the brake. Also available with cable harness.

Fans & Blowers

Lightweight 12 VDC brushless fans are available for motor and controller cooling, for maximized continuous power capability. They are also excellent for safe battery enclosure ventilation.

The blower is best for high-pressure needs such as through motor cooling in DC motors.

The accessories shown on this page represent a selection of items currently available from Solectria. Other accessories are available—call for additional information.



Solectria has extensive experience building high-performance, lightweight vehicles from start to finish. We can provide the products you need to make your plan a reality.

1994 COMPONENT PRICE LIST

Effective December 1, 1993



Drive Systems (AC Induction (high efficiency, with display outputs and regenerative braking)

Model	Max. Current	Battery Voltage	Efficiency (peak)	Price
AC200 Controller	150A	70-170V	98%	\$4890
AC300 Controller	220A	70-170V	98%	\$6995
AC300-216V Controller	220A	196-260V	98%	\$7320
AC12 Motor (16 HP)			89%	\$1390
ACgtx20 Motor (28 HP)			91%	\$1570
AC30 Motor (34 HP)			90%	\$2390

Brushless Permanent Magnet (with regenerative braking)

BRLS150 Controller	150A	40-85V	99%	\$2950
BRLS250 Controller	220A	40-85V	99%	\$3850
BRLS100H Controller	100A	60-150V	99%	\$2950
BRLS240H Controller	220A	60-170V	99%	\$3860
BRLS8 Motor (15 HP)	280/140A	60/120V	95%	\$2450
BRLS11 Motor (20 HP)	200A	120V	95%	\$2980
BRLS16 Motor (30 HP)	240A	144V	94%	\$3475

DC Brush Permanent Magnet (with regenerative braking)

DC100H Controller	100A	75-150V	98%	\$950
DC200 Controller	200A	25-75V	98%	\$990
DC20 Controller (non-regen)	20A	50-450V	98%	\$450
BPM3 Motor (3 HP)	40A	72V	86%	\$850
BPM6 Motor (6 HP)	80A	60V	88%	\$950
BPM8 Motor (8.5HP)	54A	120V	89%	\$1070

Gauges: Ampere-Hour Meter, Ammeter, and Voltmeter

AH100 Ampere-hour Counter (99% accurate, digital display; use with SH-100 shunt)	\$449
SH100 Shunt, 100A, 60mV	\$39
5H60 Shunt, 60A, 60mV	\$39
SH200 Shunt, 200A, 60mV	\$78
Ammeter (analog)	\$90
Volt Meter (analog)	\$90

Maximum Power Trackers

	Solar	Battery	Efficiency (Peak)	
MPT150N	9-170V, 6A max.	180V max.	99%	\$698
MPT150HN	9-170V, 15A max.	180V max.	99%	\$950

DC-to-DC Converters, 12V Output (85-90% efficient, provides 12V from 20-400V main battery, depending on model. Please specify input voltage when ordering.)

DC-DC100 100W output (12V, up to 8A), 20-190V input	\$259
DC-DC200 200W output (12V, up to 16.5A), 20-190V input	\$329
DC-DC380 380W output (12V, up to 32A), 50-400V input	\$395
DC-DC750 750W output (12V, up to 60A), 50-400V input	\$790

Battery Chargers (compact, lightweight, for on-board or off-board use)

Model	Weight	Input Voltage	Power Output	Volt. Range	Efficiency	
BC1000	8.2 lb.	120V AC	1000W	100-190V DC	91-92%	\$1250
BC2000	12 lb.	220V AC	2000W	100-200V DC	93-94%	\$2990
BC3000	14.5 lb.	220V AC	3000W	100-270V DC	93-94%	\$3870

Connectors

50A, 2-pin	\$9
50A, 3-pin	\$10
175A, 2-pin	\$15
175A, 3-pin	\$30

Gearboxes

AT600 w/ACgtx20 motor	\$2920
AT1000-2	\$2600
AT1000-3	\$2800

Accelerator/Brake Controller

5 kilo-ohm potentiometer with integrated spring return, compatible with all Solectria Motors.

ABC1	\$40
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Solectria also carries a wide variety of switches, fans, blowers, and other accessories. Please call for pricing and availability. Prices are subject to change without notice.

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NEW AC INDUCTION MOTORS AND CONTROLLERS

Effective June 2,1994



The following charts are to replace the information given in Solectria's 1994 Electric Vehicle Component catalog. We anticipate releasing higher power motor controllers this summer. Please call for more details.

CONTROLLERS

<u>Specification</u>	<u>AC200*</u>	<u>AC220</u>	<u>AC230</u>	<u>AC320</u>	<u>AC325</u>
Peak Power (kW)	15	25	34	34	42
Continuous Power (kW)	10	14	19	19	22
Nominal Voltage (V)	120-180	120-144	180-216	120-144	156-180
Safe Operating Range (V)	80-220	80-170	150-250	80-170	120-220
Maximum Mechanical Motor Output (HP)	18	27	37	37	45
Maximum Motor Current (A)	160	180	165	240	240
Maximum Battery Current (A)	120	180	165	240	240
Efficiency @ Nominal Power (%)	98	98	98	99	99
Efficiency@ Full Load (%)	94	95	94	95	95
Weight (lb.)	14	19	20	19	20
Dimensions(inches)	12x8x5	17x9x4	17x9x4	17x9x4	17x9x4
Price (\$)	3,990	5,890	6,995	6,480	7,450

*The AC 200 does not have any outputs for dashboard signals.

MOTORS

<u>Specification</u>	<u>AC12</u>	<u>ACgtx20</u>	<u>ACgu200</u>	<u>AC30</u>
Nominal Power (kW)	4	7	6	8.5
Nominal Speed (rpm)	4,000	4,000	5,000	3,000
Maximum Speed (rpm)	12,000	12,000	12,000	10,000
Weight (lb.)	51	66	66	93
Price (\$)	1,480	1,570	1,570	2,390
Dimensions (inches)		See catalog. ACgu20 has same dimensions as ACgtx20		

PEAK TORQUE OF VARIOUS DRIVE SYSTEM COMBINATIONS

<u>Specification</u>	<u>AC200</u>	<u>AC220</u>	<u>AC230</u>	<u>AC320</u>	<u>AC325</u>
ACgtx20	42 Nm	50 Nm	45 Nm	70 Nm	70 Nm
ACgu20	n/a	n/a	n/a	52 Nm	52 Nm
AC 30	54 Nm	65 Nm	58 Nm	91 Nm	91 Nm

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