



REPORT FROM ALBUQUERQUE

- ° 15 KH SILENT CONTROLLER UNDER TEST:
- ° EVDC STUDYING DEPLOYMENT SYSTEMS FOR GM G-VAN:
- ° PNM ADDS FOUR ELECTRICS TO IT'S FLEET:

A Bedford Van And an Electrica Ford Escort in a HOTEL ROOM !! This might be a first and they made an outstanding backdrop for New Mexico's first ever public workshop on EV technology.

With three real world sponsors, seven and a half outstanding speakers (I was the half), and approximately 80 in attendance, this was a very important and exciting meeting.

Our most serious problem, Marketing was immediately addressed by Dale Stolz, Manager for Retail Marketing for PNM. Dale reminded us that although EV's have been around for over 100 years today in marketing they must be approached as a new product. He then went on to explain the difficulty and time it takes to bring to market any new product. Some products like synthetic clothing have taken as much as 30 years.

Electric Power Companies like any other business are interrested in new markets for their product, so within EPRI (Electric Power Research Institute) we have the Electric Transportation program with Larry O'Connell as Manager. Larry explained their current project of bringing the GM G Van to Production by early 1988. GM will supply the shell, Lucas Chloride will supply the complete drive system, Cars & Concepts will assemble the completed van, and EVDC will arrange Marketing.

TX-II, The Eaton/Ford AC drive Van with the very compact IPM Neodymium-iron-boron PM motor and a 50% smaller & 50% lighter AC inverter was discussed by Paul Brown, Director of Electric and Hybrid Vehicle Division of D.O.E.

Dick Bassett, Electric Vehicle Project Manager at Sandia National Labs., James Brummer, Vice Pres. of Market Development at EVDC, and Michael Lechner, Product Development Engineer for PNM, spoke on Commercialization Efforts.

Sandia National Laboratories, Albuquerque, with their 14 Electrics, is fast becoming the leading on road test facility for EV Components. SNL's Jet Electrica vehicle with gelled electrolyte batteries (Gel-Cells) achieved a year of maintenance free and reliable performance. Installed in another vehicle is a silent controller, especially commissioned from PMC. With the gelled batteries this vehicle, having low thermal signature and a low noise level, will be advantageous in security patrol applications. Only two of these 15KH controllers exist, one was on display at the workshop.

EVDC (Electric Vehicle Development Corp.) will be in charge of Market Development for the GM G van, they feel that urban delivery and service fleets will be the most favorable near term market.

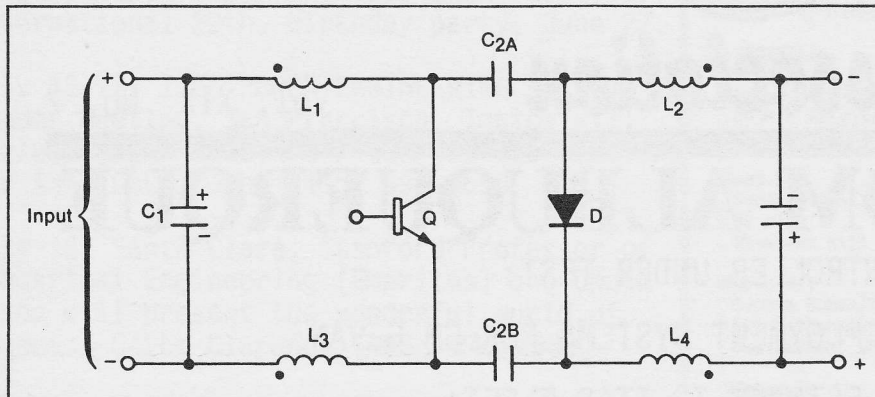
Michael Lechner, Product Delvelopment Engineer for (PNM) Public Service Company of New Mexico, is very excited about the addition of four Electricas to their electric fleet of three Bedford Vans, the electrics are used in the every day needs of the power co. Mike has organized an EV group with 10 to 25 people attending meetings. We hope they will soon be a Chapter of EAA. CALL Mike at (505) 848-2331. or PNM Alvarado Square, Albuquerque, NM 87158 (MS 0150)

Reported by Clarence Ellers

Transformerless dc-Isolated Converter

The circuit uses capacitive decoupling instead of transformer isolation.

NASA's Jet Propulsion Laboratory, Pasadena, California



An efficient voltage converter employs capacitive instead of transformer coupling to provide dc isolation. It offers buck/boost operation, minimal filtering, and low parts count, with possible application in photovoltaic power inverters, power supplies, and battery chargers.

The topology of the dc-isolated converter is shown in Figure 1. The output is isolated from the input by capacitors C_{2A} and C_{2B} . When Q is on, energy is transferred from C_{2A} and C_{2B} to L_2 , L_4 , and the load. When Q is off, energy is transferred from the source, L_1 , and L_3 to C_{2A} and C_{2B} and from L_2 and L_4 to the load. With negative coupling between L_1 and L_2 and between L_3 and L_4 , either the input or the output ripple currents may be reduced to zero, depending on the coupling magnitudes.

By making $L_1 = L_3$, $L_2 = L_4$, $C_{2A} = C_{2B}$, $K_{12} = K_{34}$, and $K_{13} = K_{24}$ (where K_{ij} is the coupling between L_i and L_j), the common-mode voltage and current ripples are made zero. The ratio of output voltage to input voltage is $\eta/1 - \eta$, where η is the duty cycle of Q. The peak voltage stress in Q is $V_{in} + V_{out} + \Delta V_{cnp}$, where V_{cnp} is the peak voltage on each C_2 capacitor. The peak current stress on Q is $I_{in} + I_{out} + \frac{1}{2}(\Delta I_{in pp} + \Delta I_{out pp})$, where $\Delta I_{in pp}$ is the peak output-current ripple.

A photovoltaic-array application is shown in Figure 2. The converter portion, consisting of Q_1 , D, L_1 , L_2 , L_3 , L_4 , C_1 , C_2 , and C_3 , converts the unregulated array output to a variable voltage, the magnitude which is controlled by the duty cycle of Q_1 .

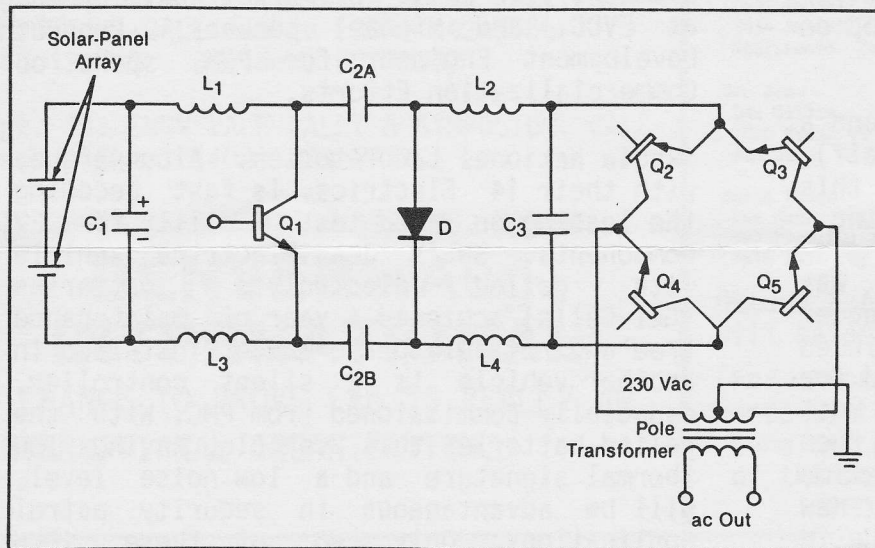


Figure 2. In the Photovoltaic Inverter Circuit with a transformerless converter, Q_2 , Q_3 , Q_4 , and Q_5 form a line-commutated inverter (polarity reverser). Switching losses and stresses are nil because switching is performed when the current is zero.

NASA Tech Briefs, May 1987

While Present Inventory Lasts -

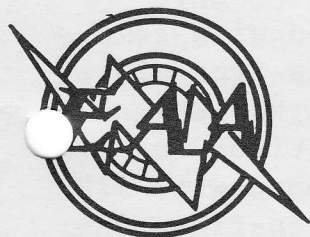
We have the following EV chargers in stock, priced much lower than today's costs would dictate:

Model 09870 - 115/230 volts AC, 60 Hz, 12/96 volts DC dual output, 25 amps, tapering to 5 amps, fully automatic electronic timer \$375.00

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COMBINED EAA/DEVC INTERNATIONAL RALLY & SYMPOSIUM



AUGUST 22nd & 23rd, 1987

THE 1987 COMBINED EAA/DEVC RALLY AND SYMPOSIUM WILL BE HELD IN THE DENVER, COLORADO, AREA ON SATURDAY, THE 22nd AND SUNDAY, THE 23rd OF AUGUST

SCHEDULE:

Saturday: 8:00 to 11:00 am, display and inspection of vehicles
11:00 am to 3:30 pm, rally
4:00 to 5:30 pm, tour of UNIQUE MOBILITY
6:00 pm, barbecue at 3298 S. Emerson, Englewood, Colo.

All of the above events will be held in the vicinity of the Cinderella City Mall, W. Hampden & Santa Fe Dr., Englewood, Colorado.

The rally run will consist of approximately 4 miles of city streets with an optional additional 4 mile loop of higher speed and a minimum of stops and grades.

Sunday: 12:00 to 1:00 pm, brunch at 2940 13th, Boulder, Colorado
1:00 to 3:00 pm, symposium at the above address
3:00 pm, hill climb up Flagstaff Mountain

Since the barbecue and brunch are at private homes, the cost will be nominal with payment expected on arrival at the event.

The Flagstaff hill climb is a mountain drive in the Boulder city limits and is arranged for those adventurous souls who want to tackle the 3.2 mile, 1200 foot climb.

CONTACT:

Electric Auto Association

Clarence Ellers, Rally Chairman

2892 Mesquite Dr.

Santa Clara, California 95051, Telephone (408) 248-2588

Denver Electric Vehicle Council

George E. Gless

2940 13th Street

Boulder, Colorado 80302, Telephone (303) 442-6566

This is another opportunity to increase the public awareness that there is an alternative to the gasoline powered vehicle that is both clean and quiet. Let's all join in the effort and make it the biggest and best ever.

ROLLING RESISTANCE TEST

Anyone who is converting a vehicle to electric power is faced with some choices regarding the size of the wheels and tires (as well as the type of tires) that should be used. The East Bay/Contra Costa Chapter of the EAA tested the rolling resistance of some different sized wheels and tires on Lloyd Wenzel's 1974 Honda Civic. This model was originally equipped with 12" wheels. Lloyd had tried 13" wheels and also a set of 14" wheels in front and 15" wheels in back. Since the rolling resistance of a large wheel is generally less than that of a small wheel, it was decided to do some simple testing that would show whether or not larger wheels would provide significantly better performance for the Honda.

Increased wheel diameter can also have a negative effect on vehicle performance. Braking can be adversely affected because the mechanical advantage of the brakes is reduced (Lloyd has noticed this for the 14" and 15" wheels vs. the 13" wheels). Also, increasing the size of the driving wheels decreases the drive train gear ratio, thus causing the motor to operate less efficiently. (The Honda is a front wheel drive car.) With this in mind, it was decided to test three combinations of wheels:

- 1) 12" wheels front and back;
- 2) 12" wheels in front and 15" wheels in back;
- 3) 14" wheels in front and 15" wheels in back.

Mounted on the 12" wheels were Michelin XZX 155SR12 steel belted radials inflated to their maximum pressure, 36 psi. The tires on the 14" and 15" wheels were Goodyear Vector P185/70R14 and P195/75R15 steel belted radials, respectively, inflated to their maximum pressure, 35 psi. It was expected that combination 3) would have the lowest rolling resistance, that 1) would have the highest rolling resistance, and that 2) would lie closer to 3) than to 1) since all the batteries are mounted over the rear wheels. Combination 2) retains small wheels in front, which keeps the drive train gear ratio favorable.

It was originally intended to pull the test vehicle at constant speed on a level surface by hand using a 0-100 pound fish scale hooked to the bumper. The reading on the scale would indicate the force required to overcome the rolling resistance of the vehicle; this force divided by the weight of the car (2800 pounds) equals the coefficient of friction. It proved difficult to pull the vehicle smoothly in this way, and so another vehicle was eventually utilized to tow the test car at a speed of about 2 mph. The road surface was smooth. Due to a very slight road grade, readings were taken while the vehicle was pulled first in one direction and then in the opposite direction. The recorded value of pulling force is the average of these two readings. The scale value oscillated as the cars moved and so could be read only to about + or - 2 pounds. Also, it was difficult to prevent a slight acceleration or deceleration of the towing vehicle. Acceleration would falsely increase the scale reading, while deceleration would decrease the reading. The results of this test are recorded in this table:

TIRE SIZE,		PULLING	COEFFICIENT	TIME:	SPEED:
FRONT	REAR	FORCE:	OF FRICTION:		
12"	12"	28 #	.010000	10 sec.	Slight deceleration
12"	15"	25.5 #	.009107	10 sec.	Constant
14"	15"	25 #	.008929	8 sec.	Slight acceleration

(The column labeled "TIME" indicates the time in seconds that it took the two vehicles to pass over a measured part of the course. Although the last test was conducted slightly faster than the first two, one would not expect a large variation of the coefficient of friction between these speeds.)

It can be seen that there was not a large difference between the different sets of wheels. The best combination required about 10% less pulling force than the worst combination. As expected, the larger wheels did have a slightly lower coefficient of friction, even though they were thicker than the small wheels. The mix of small wheels in front and large wheels in back seems to be a good compromise between lower rolling resistance and higher drive train efficiency.

Is it worthwhile to use larger wheels, at least in back? On a level surface, running at constant speed, the major components of energy consumption by an electric vehicle are the rolling resistance and air resistance. We have measured the former; the latter can be estimated as

$$\text{Air resistance} = C_D A (V/20)^2 \text{ pounds}$$

where C_D = coefficient of drag
 A = cross-sectional area of body in square feet
 V = speed in miles per hour

(Reference: Electric Auto Manual, edited by Walter V. Laski, 1977, page 31)

For the 1974 Honda Civic, $C_D = .514$ and $A = 17.54$ square feet, so

$$\begin{aligned} \text{Air resistance} &= 9 (V/20)^2 \text{ pounds} \\ &= 9 \text{ pounds @ 20 mph;} \\ &20 \text{ pounds @ 30 mph;} \\ &36 \text{ pounds @ 40 mph.} \end{aligned}$$

Therefore, improving rolling resistance about 10% by using larger wheels should result in an overall improvement in vehicle efficiency of about 8% @ 20 mph; 6% @ 30 mph; and 5% @ 40 mph.

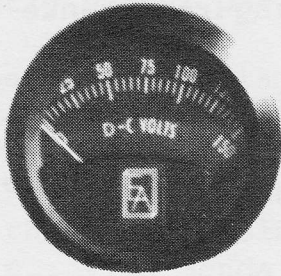
Jon Gabel, 5/12/87

A GOOD DISCUSSION OF THE COSTS OF WATERING LEAD-ACID BATTERIES appears in the April issue of *Alternate Energy Transportation*, pages 3, 4 & 5. At \$25/hour for labor, it costs about \$200 per commercial van per year to water the batteries, if they are lead-acid and watered individually. Faster and cheaper methods, such as central point watering, are available; but it would be nice to eliminate the chore entirely. Of course this will be the case with some of the promising new candidates if and when they come on line. Meanwhile, Johnson Controls (at the urging of DOE) has been experimenting with the "gel-cell" lead-acid battery which of course is sealed. There are at least 400 vehicles equipped with these batteries presently on the road. Sandia National Laboratories in Albuquerque has been testing these batteries and have attained a range of nearly 100 miles under special conditions (See the DEVC Newsletter for May 1987 p5.).

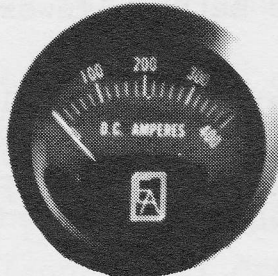
From DEVC Newsletter, June 87

INTRODUCING WESTACH EV GAUGES

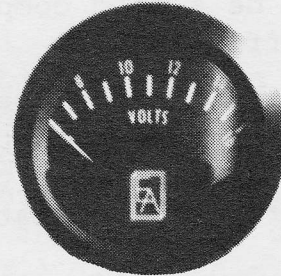
Not available anywhere else!



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PM Motors, Low Cost NiCad Batteries, Quiet Electric Garden Tractors/Mowers, Power Tools, Inverters, BioLyte (improves battery efficiency and life by lowering resistance). Catalog \$3. Kansas Windpower, Route 1W, Holton, KS 66436. (913) 364-4407. Send SASE for price list only. Bob McBroom.

Moving to Pennsylvania Sale

NET Electra-Van 600, \$600. Needs body work, batteries, and a reverse gear. BIC LPG 600. Engine runs rough. \$1000 for both. (408) 243-7779.

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NOTE!!

EPRI Video tape (ELECTRIC VEHICLE RESEARCH) Is available on request.
CALL or WRITE; John Newell (415) 591-6698
Days, 1249 Lane St. Belmont, CA 94002.

PROJECT X

We have started a fund with \$1000 to design & build a STATE OF THE ART HYBRID VEHICLE as an EAA project. We will need a minimum of \$10,000 for this project anyone wishing to contribute please send check to EAA PROJECT X, Lee Hemstreet 787 Florales Dr. Palo Alto, CA 94306.

ADS must be received with payment by the 10th of the month, for the following month's issue. AD rate is min. 1 to 5 lines \$5.00, 1/4 Pg. \$15.00, 1/2 Pg. \$25.00, full Pg. \$50.00, full Pg. 2 sides \$100.00. For Sale, Wanted, Trade, etc. Mail to EAA 1249 Lane St. Belmont, CA 94002.

2. Two-hundred-sixteen car drivers started out in 1903 on an 870-mile race from Paris to Madrid. But few people along the route ever before had seen a car. So they waited in the road. By the time the lead car had gone 343 miles — when the whole thing was called off — the racers had killed 550 spectators.



CALENDAR

July 4: Peninsula Picnic was changed to our International 20th. Birthday party, June 27.

July 12-17: IEEE POWER ENGINEERING SOCIETY Summer Meeting, San Francisco. Topics will include SOLAR ELECTRIC POWER For two sessions For Info CALL: John (415) 591-6698

July 18: Santa Clara, Stanford Professor of Electrical Engineering (Emeritus) and Chuck Olson will present the wonderful world of Magnets. CALL: Clarence (408) 248-2588

July 26: Seattle, Jamboree & Picnic, Gas Works Park, CALL Ray (206) 542-5612

Aug. 22-23: DENVER INTERNATIONAL RALLY & SYMPOSIUM, CALL George (303) 442-6566
2940 13th St. Boulder, CO 80302

Sept. 19: SUNNYVALE RALLY & SYMPOSIUM, CALL Mike or Shari (408) 429-6717

July 28-29 IEEE CONTROL SYSTEMS, MADRID

DENVER - Aug INTERNATIONAL

A CHANCE TO PROVE EAA IS REALLY AN
INTERNATIONAL ORGANIZATION,

EAA Chapters

Call the contact person for meeting times and places.

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OREGON: Willamette

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Hunt. Bch. CA 92647

Denver, CO DEVC

Genny Clark (303) 451-5051

Fox Valley IL

John Stockberger
25643 Nelson Lake Rd.
Batavia, IL 60510

Eastern (215) 696-5615

PO Box 717
Valley Forge, PA

For information on forming a chapter in your area write Electric Auto Association, 1249 Lane St. Belmont, CA 94002. For a sample copy of the newsletter send SAE #10 envelope.
PHONE (415) 591-6698

EDITORS: - Walter Laski - John Newell - Bill Palmer - Paul Brasch - COMPILED AND
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EVENTS. ARTICLES-Comments etc. all correspondence to address below

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NEWS

Association

JULY 1987

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