

PRIME by Prevest

Saving Fuel by Reducing Parasitic Engine Loads

by Larry Plachno

Photos courtesy of Prevest



Prevest's new PRIME System is a milestone for the bus industry and an obvious achievement by Prevest's engineers. It improves fuel economy and reduces pollution by minimizing parasitic engine loads. PRIME allows you to increase fuel economy by taking advantage of innovative technology.

Prevest has an enviable reputation for going greener and reducing pollution. Their Volvo engine has already been widely acclaimed for reducing pollution while increasing fuel efficiency. The Prevest engineers have again been busy looking for more ways to go green and improve fuel economy. New for 2013 will be aluminum baggage bay doors and a new Bitzer compressor. Prevest's new PRIME system will be available starting with 2014 models.

Having already made major advances with the engine itself, the Prevest engineers began looking at what the experts would call parasitic energy loss on the engine. This involves various components or systems that take power from the engine and hence detract from engine efficiency while reduc-

ing fuel economy. Obvious components and systems that fit into this category are air conditioning, the alternator or alternators that keep the batteries charged, the air compressor that fills the air tanks, and frequently a few other items.

What is PRIME?

PRIME stands for Power Recovery by Intelligent Management of Energy. What the Prevest engineers have come up with is an ingenious method of generating electrical power with the alternator and compressing air with the air compressor with minimal parasitic load on the engine. This is a milestone for Prevest electrical systems and a major step forward in going green for the bus industry.

Alternators for generating electrical energy to charge batteries are typically belt-driven from the engine although I have seen buses with a direct mechanical link. Regardless of which connection system is used, turning the alternator places a parasitic load on the engine that decreases fuel efficiency and effectively decreases engine power – some sources say by as much as 14 horsepower.

One of the reasons for doing things this way is because we have used lead-acid batteries for starting buses as long as I can remember. Lead-acid batteries are great for starting since they provide the rush of power we need. However, they can be damaged by being deeply discharged, so we want to keep them up close to full charge if possible. Hence, your

alternator is always running although it is only charging the battery when needed.

The parasitic load of the alternator on the engine also increases fuel consumption. While there are variables involved, a good educated guess puts this additional fuel consumption at somewhere around eight gallons of fuel, if you run that coach on a five-day trip and average 10 hours of driving on each day for a total of 50 hours. At today's diesel fuel prices, it represents a net savings of \$32. When you look at numbers like that, you can see some obvious savings here.

Your air compressor also provides a similar parasitic load on the engine and reduces its fuel efficiency. To some extent, the air compressor may be less of a problem because it only runs in compression mode 10 to 30 percent of the time. If you use your brakes frequently, if you use air for some accessory or if you have leaks in your air system, then the air compressor will run more frequently.

How PRIME Works

What the Prevost engineers have done with their PRIME system is to develop a method that minimizes the need to charge the battery and use the air compressor when the engine is under load. Instead, they maximize the battery charging and air compressor activity when the system detects a negative torque condition on the engine.

What this means is that if you are driving on a hilly road, the battery charging and air compressor would come on when you are going downhill and not feeding fuel to the engine. Hence, you are not paying a penalty in fuel consumption or loss of engine power to generate electricity for your batteries or put air in your air tank. Some people have suggested that this is akin to, but not exactly the same, as regenerative braking since you are effectively getting electricity and compressed air without putting a load on the engine.

In order to accomplish all of this, the Prevost engineers have made several changes to the traditional coach systems. One of the more obvious is that they are using Absorbed Glass Mat (AGM) batteries instead of the traditional



The Prevost PRIME system monitors battery charge, air pressure and engine torque without any intervention on the part of your driver. It makes the appropriate decisions to maximize fuel efficiency and minimize pollution. However, a new gauge has been added to the dash to let the driver know when the coach is running on "free electricity."

lead-acid batteries. Unlike lead-acid batteries, the fluid in the AGM battery is sealed and hence requires no ongoing maintenance. However, AGM batteries have an advantage over lead-acid batteries in that they can take repetitive deep discharges. Hence, the AGM batteries can go for longer periods before they need electricity to top off their charge.

The way the PRIME system works is that it monitors battery charge levels, air pressure and engine torque and looks for the engine to enter negative torque operation. This would normally occur when going downhill, when the driver takes his or her foot off of the accelerator pedal, or when the driver starts braking for any number of reasons. When the PRIME system detects this negative torque situation, it then checks the battery charge condition and air pressure. If the coach needs battery charging or more pressure in the air tanks, then PRIME turns the alternator or air compressor on.

Hence, under ideal conditions, you are getting your batteries charged and your air tanks filled without wasting any additional fuel. However, there will be times when there may be no negative torque situation on the engine for quite some time, such as when you are using cruise control on a flat

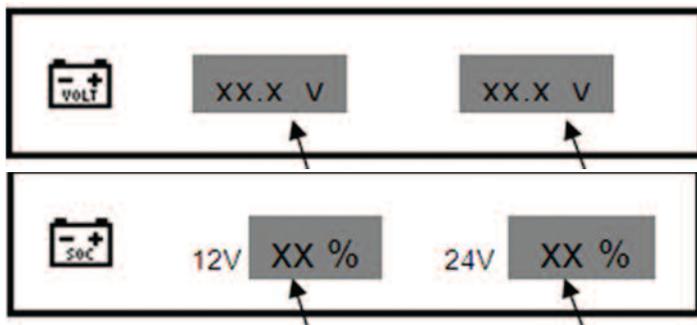
highway. In this situation, the control system will put safety over economy and trigger battery charging or the air compressor regardless of the engine situation.

Prevost has also added a new equalizer to monitor the state of charge (SOC) and the state of health (SOH) of the batteries. The system monitors battery temperature to prevent overcharging and overheating. It also provides information to the driver on the battery state of charge.

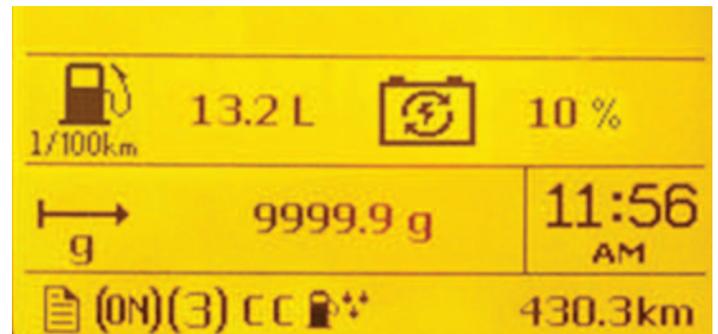
There is also a new feature in the instrument cluster. A new gauge has been added that shows the driver the percentage of time the coach is running on "free electricity." This includes the times when the coach is not taking extra fuel from the engine to generate electricity. When driving, the instrument cluster shows the percent of trip made with regenerative electricity. This is seen as an incentive to the driver to adopt efficient driving habits.

Advantages of PRIME

There are some very obvious advantages to having the PRIME system on your coach. One would be decreased lifecycle costs on batteries. The AGM batteries cost about



Gauges on the dash keep the driver informed of both the state of charge of the batteries and their current voltage.



Now included with the instrument cluster is a new gauge showing the percentage of time the coach is running on "free electricity."



Shown here is a new Prevost H3-45 VIP conversion shell. The Prevost PRIME system will be included as standard equipment on 2014 model conversion shells.

Shown here is a new Prevost X3-45 commercial seated coach. The Prevost PRIME system will be offered as an option on 2014 model Prevost seated coaches.

twice as much as lead-acid batteries, but they last up to four times as long. While the AGM batteries do have an electrolyte, it is absorbed into a fiberglass mat separator. Hence, they are sealed and require no maintenance for their lifetime. In addition to the overall savings related to fuel economy, you no longer have maintenance cost associated with batteries. The net result is a reduction of your total operating cost.

PRIME will increase your fuel economy. Estimates suggest a two percent savings with PRIME. Apparently, the amount of savings may depend on your local road conditions and type of service. Coaches driving on up-and-down hilly roads will most likely gain the most from PRIME. Coaches used in local tours or commuter service that make frequent stops may also find increased benefit from PRIME.

On top of everything else, PRIME improves the environment. The greater fuel economy leads to decreased emissions and continues Prevost's commitment to improve the environment.

Availability

PRIME will be an option on forthcoming 2014 model Prevost H-series seated coaches and X-series seated coaches. It will be provided as standard equipment on Prevost's H3-45 VIP and X3-45 VIP conversion shells.

Other 2013 Prevost Improvements

Another Prevost improvement for 2013 is new aluminum luggage bay doors on the X3-45 model. They feature a redesigned door handle with a lock integrated into the plastic casing. The new aluminum doors are lighter in color and more attractive than the previous dark grey doors. In addition, the aluminum used is twice as thick as the former stainless steel and hence will resist dents better.

One big advantage of the aluminum doors is lighter weight. They reduce weight by 38 percent or about 265 pounds per coach. This in turn reduces fuel consumption and improves the environment. It was also noted that aluminum is easily recyclable and hence more environmentally friendly. This weight

reduction represents 0.25 percent of fuel economy.

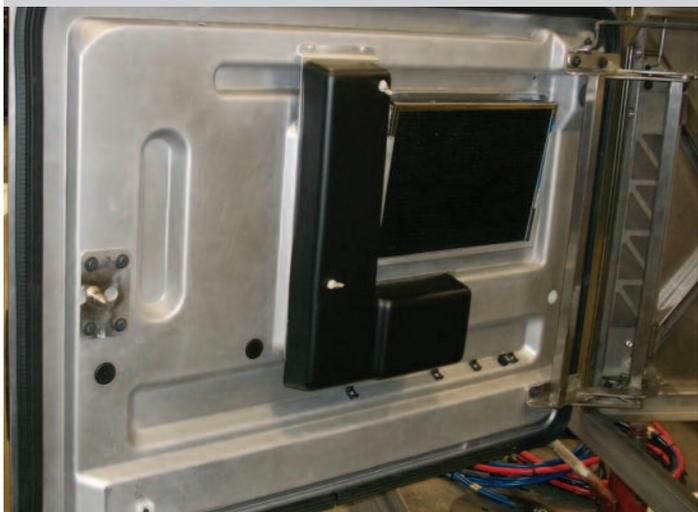
For 2013, Prevost is also replacing the traditional Carrier 05G compressor with a four-cylinder Bitzer compressor. The Bitzer compressor is mounted directly to the engine, providing a shorter and more accurate belt span. It also weighs 100 pounds less than the previous compressor and provides more capacity with a smaller load on the engine. Since it is mounted on the engine, the Bitzer compressor transmits less vibration to the bus structure because it is somewhat insulated through the engine mounts.

Tests have shown that this new compressor will improve fuel economy by about 0.2 percent and reduces engine load by about four horsepower. All of this translates into better fuel economy. The Bitzer compressor has been used on Volvo vehicles for years and is a proven design.

For more information on all of these Prevost improvements, contact your Prevost representative. □

Prevost's new aluminum luggage bay doors for the X3-45 feature a redesigned door handle with a lock integrated into the plastic casing.

Although twice as thick as previous doors, the aluminum luggage bay doors will reduce weight by 265 pounds per coach.



From the January 2013 issue of National Bus Trader



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