



Power. On the go.™

**AuraGen VIPER
Underhood Mobile Power System**

Tri-Service Power Exposition

Aura Systems, Inc.

El Segundo, CA

July 2003



AURA
SYSTEMS INC



Auragen[®] Underhood Power Generation Source



Auragen[®]

- **Up to 8 kW Continuous/9 kW Peak Power**
- **High Quality AC, DC and Silent Watch**
- **Completely integrated into vehicle for transparent operation**
- **No Handling/Prep, and No Scheduled Maintenance**
- **On-Demand Power, Continuously as Required, over complete range of vehicle operation:**
 - **Parked**
 - **Engine-on**
 - **Engine-off Silent Watch**
 - **Mobile**
 - **Engine Idle to Red-Line**



AuraGen® VIPER (Vehicle Integrated Primary Electrical Resource)

Ruggedized Military Version of AuraGen Commercial System



AM General LTV (HMMWV)



Stewart & Stevenson FMTV



Auragen[®] Underhood Power Generation Source



Auragen[®]

- *Why Use the Auragen?*
 - *Responsive On-Demand Power, Anywhere, Anytime*
 - *& also Save:*
 - *Time*
 - *Weight*
 - *Size*
 - *Money*



Aura Systems, Inc.

Located in El Segundo, CA

Providing a full mobile power solution with expertise in:

- **Research and Development**
- **Electrical, Mechanical, and Software Engineering**
- **Vehicle Integration**
- **Assembly and Test**
 - 5,000 unit per month capacity, expandable to 10,000
- **Customer Service**
- **Nationwide Field Service**
- **ISO 9001:2000 Certified**





AuraGen Underhood Application Types: On-Demand Power, Anywhere, Anytime,

*& Save: Time,
Weight,
Space,
Money.*

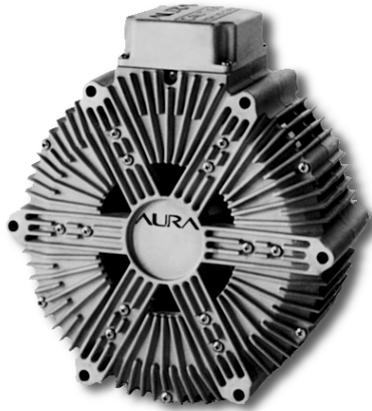




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VIPER: Major Transformation of Mobile Electric Power

- Save per 5KW AC Hauled-Towed Genset:**
- > Up to 2,145 Lbs. Weight
 - > Up to 408.8 Cu. Ft. Volume
 - > Up to 17% of HMMWV Fuel Mileage
 - > All Vehicle Mobility & Trafficability: Same CG
 - > Immediate Power on Demand: No Prep
- > Up to \$10,000+ Directly + 100's of Work-hours/Yr. Per Genset: No Scheduled Maintenance**
- While Providing in Single System: AC, DC, Silent Watch Power*



12" Diameter

Underhood

AuraGen Power Source

Generator





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AuraGen VIPER Component Overview

Convenience Receptacles



And/Or



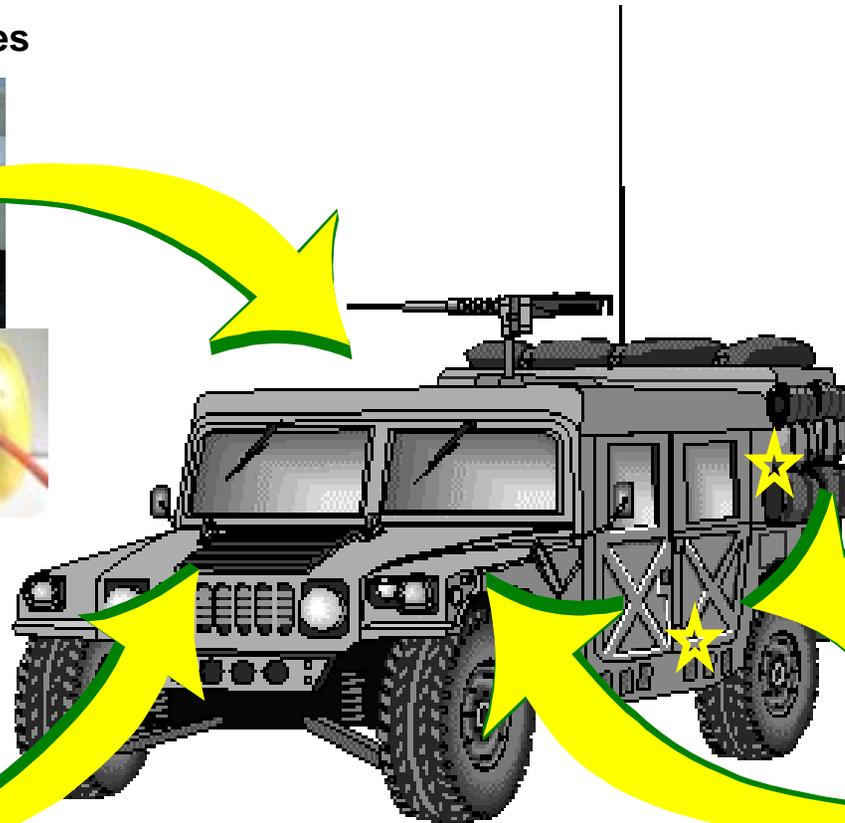
Electronic Control Unit



Generator



Idle Controller





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AuraGen/VIPER Specifications

Generator

- Diameter
- Width
- Weight
- Environ. Temperature Range
- Environmental Conditions
- Operating RPM Range*



12.16 in.
 5.085 in.
 G-5000: 62 lbs.; G-8500: 65 lbs.
 -40°F to +200°F
 Under Hood
 1200 to Red Line (Gasoline)
 950 to Red Line (Diesel pick-up trucks)
 650 to Red Line (Diesel mid-sized vehicles)

ECU

- Length
- Width
- Height
- Weight
- Environ. Temperature Range
- Environmental Conditions



19.27 in. }
 10.50 in. } 1.2 cu. ft.
 8.12 in. }
 G-5000: 52 lbs.; G-8500: 58 lbs.
 -40°F to +125°F
 Weather-Proof, Can be Mounted
 In or Under Truck Bed



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AuraGen/VIPER Specifications (cont'd)

System:

- **Power Types** : All-AC, All-DC, AC/DC, AC-DC-Silent Watch
- **Power Quality**: << DoD MEP Requirements
- **Power Safety** : Water-proofing, GFI, Low Speed Control
- **HMMWV Fording**: 30 in. Min. to 60 in. Max.
- **Endurance** : 7,000 Hours Continuous Run Testing
- **Ruggedness** :
 - { Airdrop Certified
 - { 113 Vehicle-Years with US Army
- **Vehicles** :
 - { HMMWV,
 - { FMTV,
 - { CUCV,
 - { Heavy Duty Truck,
 - { Medium Duty Truck,
 - { SUV,
 - { Van,
 - { Pickup.



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AuraGen® Technology Advantages

- AuraGen® axial gap design allows reduction of magnetic path by as much as 70% over traditional design: less iron = less size and weight
- AuraGen® is a fraction of size and weight of a conventional induction machine
- No motor brushes to wear out
- No exotic permanent magnets
- Uses only standard materials:
aluminum, copper wire, steel
- Uses only one moving part (rotor)

Typical Induction Machine	AuraGen®
10 HP, 7,480 watts	10.7 HP, 8,000 watts
Weight: 230 lbs	Weight: 65 lbs

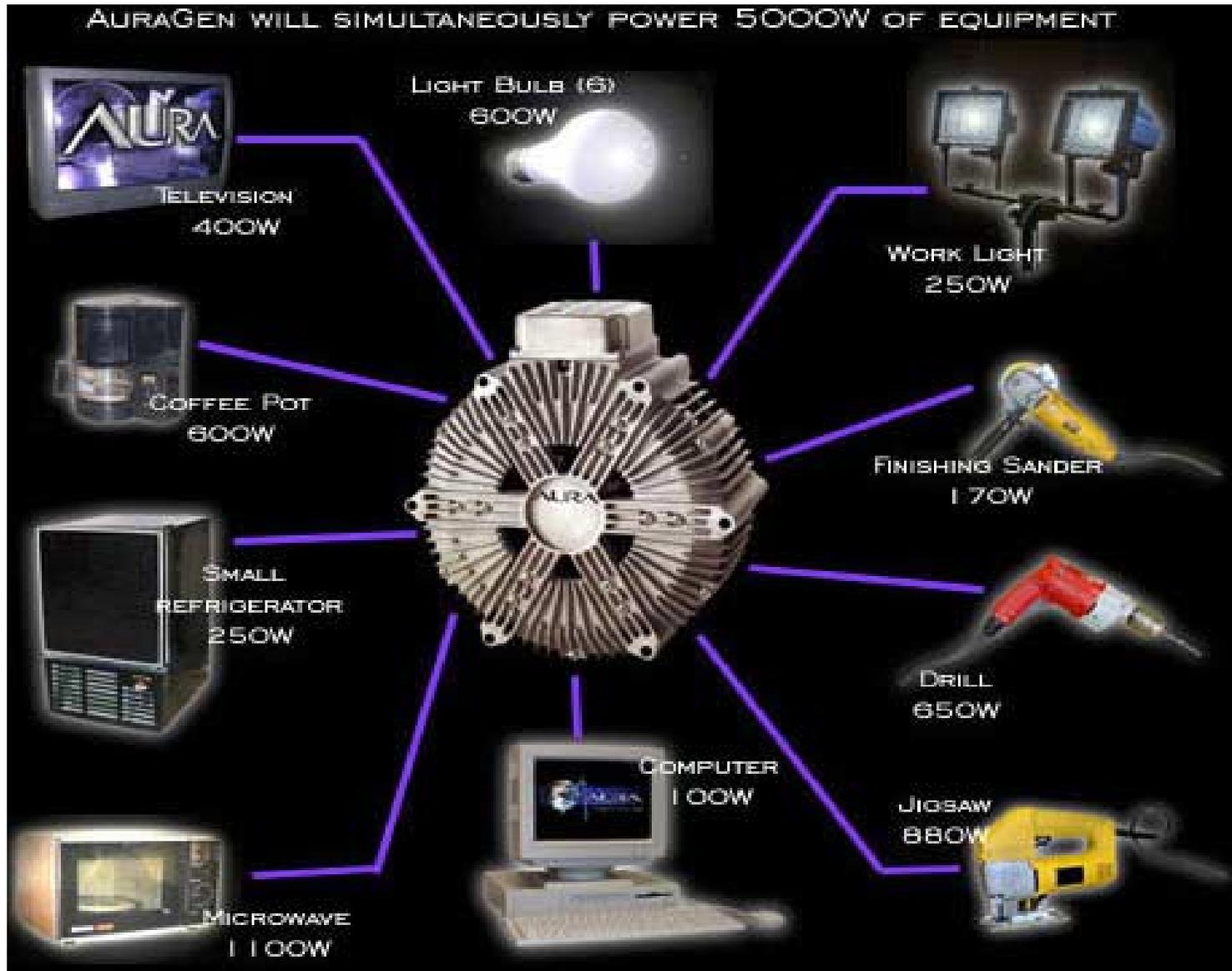
•AuraGen® magnetic design protected under Patent 5,734,217

Simplicity makes the AuraGen® the most reliable unit available
Plus Aura's Patented design shrinks the machine to a useful size



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AuraGen®: 5,000 to 8,000 Watts, Any Type Device, Continuously





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Some AuraGen® Customers

◆ Utilities:



- ◆ Enmax Corp.
- ◆ Equitable Gas Co.
- ◆ So. California Edison
- ◆ Virginia Power

◆ State Agency/Municipalities



- ◆ Caltrans
- ◆ City of Los Angeles

◆ Emergency Response:



- ◆ Red Cross
- ◆ Fire/Rescue

◆ Law Enforcement

- FBI
- BATF
- LAPD
- ◆ Border Patrol



◆ Telecommunications:



- ◆ Cox Cable, Time Warner
- ◆ KATV, KNBC, WBZ, WVLT

◆ Petroleum Exploration/Services:



- ◆ Schlumberger
- ◆ BJ Services

◆ Industry:

- ◆ Altec Bucket Trucks
- ◆ Ford Ship-Thru Program
- ◆ SAIC VACIS Veh. Inspection
- ◆ SPX- GM Goodwrench Fleet



◆ Defense:

- ◆ US Army, USN, USMC, USAF



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Homeland Security Vehicles



NRL InfraLynx HUMMER



SAIC VACIS INTERNATIONAL



GMC SUBURBAN



FORD EXCURSION



AuraGen® VIPER (Vehicle Integrated Primary Electrical Resource)



AM General HMMWV



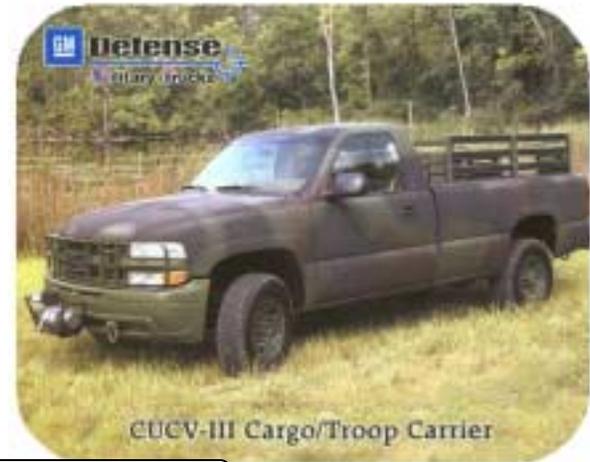
Stewart & Stevenson FMTV



Dodge Ram COMBATT



General Motors





Some AuraGen® VIPER Application Types

SBCT & PM Platforms

1st COSCOM

SOCOM



SICPS SHELTER HMMWV



COMM SYSTEM HMMWV



HREE FMTV

Raytheon Company

82nd Airborne Div.

Stewart & Stevenson



**RECONFIGURABLE C2
PLATFORM (RC2P)**



COMMAND HMMWV



LHS FMTV



AuraGen VIPER Combat Support

Operation Enduring Freedom:

➤ Two Commands:

- In Afghanistan almost immediately after 9/11, operating ~24/7 for 4 months, specifically “40 days and 40 nights continuously in one stretch.”
- Continuing operations into 2003

Operation Iraqi Freedom:

➤ Three Commands:

- Iraq operations included first VIPER combat “airdrop, operating VIPER 24/7 for 60 continuous days; no problems – very pleased.”



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AuraGen VIPER Customer Comments

“VIPER worked as advertised.”

173rd Airborne

“VIPER is essential.”

82nd Airborne

“VIPER is a really value added system. ...on all TOC's and ... primary power on all jumps of ACP. ”

3rd COSCOM

“...VIPER, after airdrop ... continuously 24/7 for two months ... no problems ... very pleased.”

JG

“We've got to find a place to hide the the VIPER vehicle [in Afghanistan], otherwise everyone else is going to be borrowing and using it.”

SOCOM

“... the VIPER system demonstrated ... being a superior alternative to existing HMMWV alternators and an excellent augmentee to utility generators. ... a true operational and maintenance enabler ... the potential to save real dollars and maintenance man-hours while enhancing vehicle and mission performance.”

Army Report



Comparison to Military Tactical Quiet Generators (TacGens)

AuraGen VIPER Compared to
HMMWV Hauled/Towed 5 KW All-AC MEP 802A & PU-797

The AuraGen VIPER, per Watt produced, is:

5.1 to 13.1X Lighter

28.3 to 341.1X Smaller

2.6 to 3.3X More Fuel Efficient

1.96 to 3.21X Lower Cost

22.6 to 100.3X Better per Watt

+ VIPER can provide DC and Engine-Off Silent Watch,
and on-demand power, continuously,
and requires no Scheduled Maintenance, Effectively
Saving 100's of manhours and 1,000's of \$ per year per genset.



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AuraGen® VIPER Benefits

➤ To Mobile Tactical and Combat Support Operations:

- On-Demand, Continuous Power Performance, Even at Low Engine Speed
- Reliability
- Vehicle integrated transparent operation
- No noise above vehicle engine, or no noise at all with Engine-Off Silent Watch
- Mobile and/or parked operation
- Full Mobility & Trafficability

➤ To Logistics:

- Light weight & small size for deployment, operations and fuel economy
- Versatility: AC or AC/DC or All-DC or AC/DC/Silent Watch Power
- Clean power for any type of equipment
- Scheduled maintenance-free, handling-free operation
- Efficiency of power production for reliability and fuel economy

➤ To Programs and Budget:

Cost effectiveness = Superior performance + Cost savings



VALUE



The AuraGen/VIPER Underhood Mobile Power System

Transformation of Mobile Power - Today

Patent # 5,734,217 and # 6,157,175

Ron Goldstein: Tel: 310-643-5300, x213

Email: rgoldstein@aurasystems.com

