SALES PRO

SP056

Revised June 7, 2023

Vector™ Electric Fire Truck

Charging Guidance

Roger Lackore

REV Fire Group

Introduction

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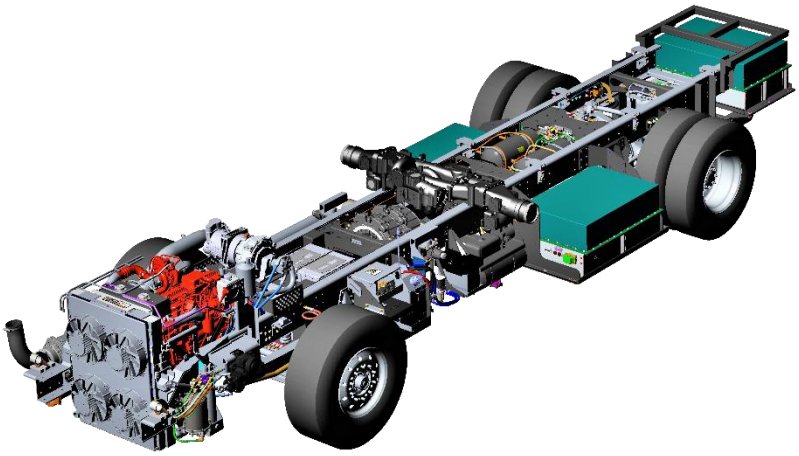
The Vector™ is a Plug-In Battery Electric Vehicle with Range Extender (BEV-X). It has enough battery storage to run in all-electric mode in most urban or suburban duty cycles without ever firing up the range extender. The range extender is on-board to provide battery charging in the event that the apparatus needs to pump for extended periods of time, or if the fire department connection to the electric grid is lost.

Your electric apparatus will only work well if you have invested in an adequate DC Fast-Charging system. The size, brand, and physical charger location are all important considerations.

We recommend engaging a company experienced in DC Fast Charging installations who can work through the details.



Charging Socket

The Vector™ has a CCS1 charging socket that accepts a CCS1 plug for DC Fast Charging up to 150 KW. The department will need to install a DC Fast charger in the bay of the station to charge between calls. We strongly recommend a 120 KW or 150 KW charger. While the apparatus can be charged at lower power, the higher the power the quicker it will be topped off and ready to go after each run.

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Charge Socket Location

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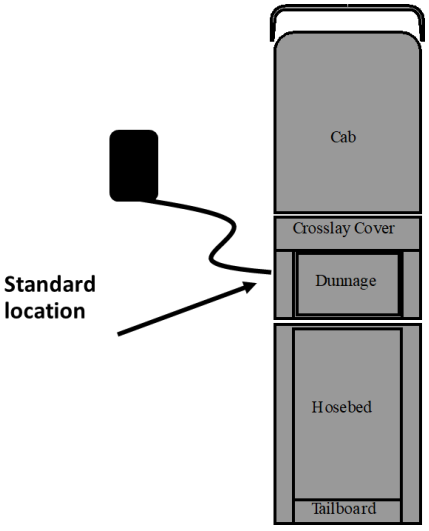
The standard location for the charge socket is on the driver's side pump panel.

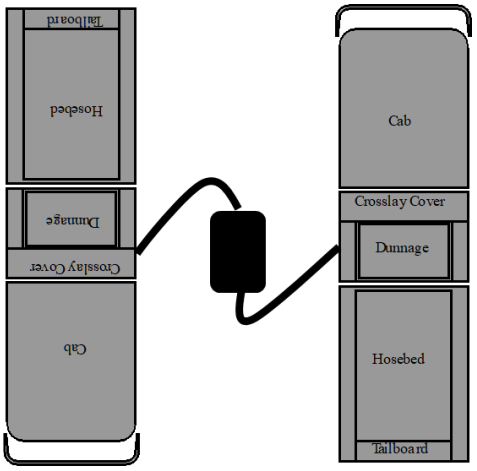
If your department has a need for the charger in an alternate location, see your factory representative for review.



It is not practical to consider specifying two sockets on the same apparatus. Two sockets that are live all the time would require extra electronic control and software because you can't have two sockets feeding power at the same time.

If you plan to have more than one apparatus using the same charger, consider how they will be parked in your bays.

Two sockets on one apparatus is not currently available on Vector apparatus.



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EV Charging Equipment Selection and installation

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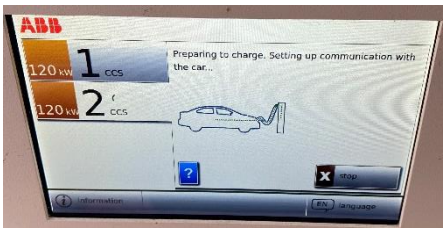
The style and type of EV charging equipment needs to be reviewed with each installation site considering the space and electrical infrastructure capacity of the facility.

REV has gained experience with two brands of fast charger during Vector development, ABB and Kempower.

While either will charge the Vector, our experience with the Kempower charger has been more reliable and consistent so far. Kempower offers the ability to keep power flowing to the vehicle even after the EV batteries are topped off. This means you can keep vehicle functions like flashlight chargers, and radios ON and and the pre-condition the cab to counteract environmental factors such as heat or cold without draining the EV batteries.

Feature	ABB	Kempower
User Interface Display	Displays information adequately	Nicer user interface
Trickle Charging	Not available	Chargeye software can provide vehicle power after EV batteries are charged
Power Unit Location	Option to install outside	Option to install outside
In-Bay Terminal	Cord terminal hung from the ceiling. Cord retraction method left to the installer.	Slim satellite terminal with spring-assist cord support. Optional ceiling installation.



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Kempower Charger – (Recommended)

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Kempower sells a CCS1 charger that comes in two parts. The power cabinet converts 480V 3-Phase line current into DC power. The power cabinet makes noise and therefore should be located outside the fire hall. The Satellite Terminal will be located in the apparatus bay next to the driver side pump panel in the location where the Vector will be parked when not on a response.

Kempower units can be purchased with software that will keep up with apparatus power draw even after the EV batteries are fully charged. This is a useful feature, allowing the Vector to be left ON between calls without loss of response range on all-electric.

Additional benefits:

- **Spring-loaded charge cord**
- **Easy user-interface**
- **Reliable Vector charging experience**

Power Cabinet

Budgetary Estimates*

Power Cabinet and Satellite Terminal	MSRP	$	80,000
Charge-Eye Software	Annual Fee	$	624
Warranty	2 Year	$	-
Extended Warranty	Per Year up to 10	$	2,460

	Initial		Annual Fee	
Total with 5 Year Warrenty	$	87,380	$	624

Prices are MSRP at time of publication and intended for reference only. Contact the manufacture for quotations

Satellite Terminal

Kempower Sales Contact:

Josh Mueller
joshua.mueller@kempower.com
+1 (919) 748-0815

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ABB Charger

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The ABB HVC Depot box offers a 150 KW charger that can be suspended from the ceiling to provide a drop cord next to the Vehicle charging port on a tool retractor while maintaining the areas around the vehicle clear. A retraction cord will be needed and can be worked out with your installer.

Budgetary Estimates*

Power Cabinet and Terminal		$	96,000
Activation	One-time Fee	$	1,100
Charger Connect	Annual Fee	$	300
Network	Annual Fee	$	600
Warranty	2 Year	$	-
Extended Warranty	Per Year up to 5	$	5,000

	Initial	Annual Fee
Total with 5 Year Warrenty	$ 112,100	$ 900

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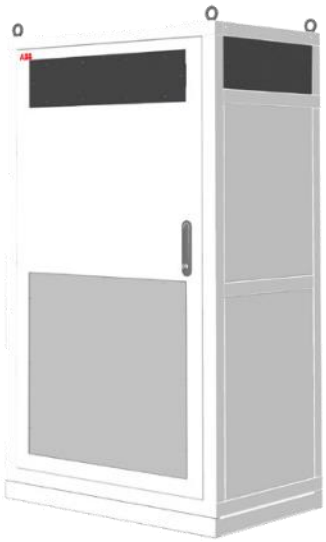

Power Cabinet

ABM is a Value Added Reseller for ABB products. They can perform site visits, quote on utility upgrades, install the charger, and propose a charger maintenance plan.

ABM E-Mobility Contact:

Thomas Berton, P.E.

Director – eMobility & Electrical Infrastructure

ABM Electrical Power Services, LLC

thomas.berton@abm.com; EVsales@abm.com

724-705-5918 (C)

Satellite Terminal

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Utility Infrastructure

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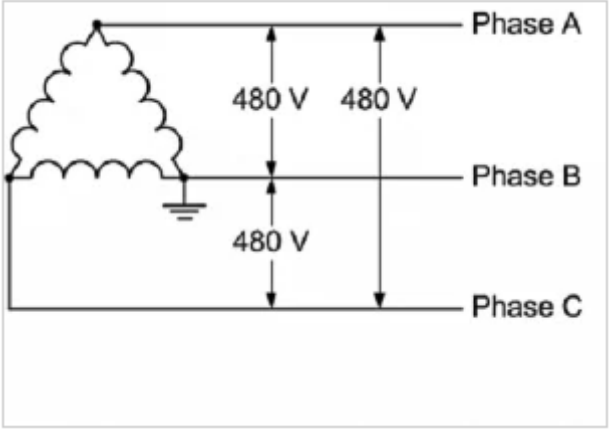
DC Fast charging requires 480 volt 3-phase service. Most US industrial facilities use 480V 3 Phase because it provides twice the power with the same current. The same power with less current means:

- **Reduced construction costs with smaller electrical service, wiring, conduits, and electrical devices.**
- **Reduced energy costs**
- **Less energy lost to heat in the form of electrical resistance.**



If your local utility does not offer 480 V 3-Phase service in your area, it is possible to use a transformer to step-up the power from 240 V 3-phase.

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Public Charging

There are many brands, models and capacities of EV chargers on the market. Any CSS1 charger should be able to charge the Vector™. We have tested a number of publicly available charging units and have not found any so far that are not compatible.

Level 1 and Level 2 Charging

Level 1 charging uses 120 V single-phase AC house current to feed an on-board charger. The on-board charger converts the AC current into 800 V DC current to charge the EV batteries. This will work through the standard Vector charge socket.

Level 2 charging is the same process using the same socket, but it needs 240 V three-phase AC current instead.

The Vector™ can be ordered with an on-board charger capable of accepting either Level 1 or Level 2 power from a standard SAE J1772 plug. The system determines whether the charge is coming from a Level 1 or Level 2 charger automatically.

System	Charge Time (hrs)*
Level 1	45
Level 2	15
DC Fast	3

Charge times are for reference only and can vary based on a number of system and environmental factors.

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Renewable Energy Micro Grid

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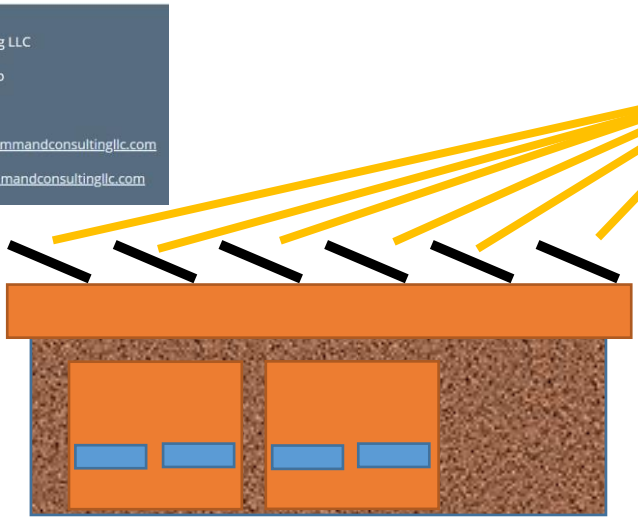
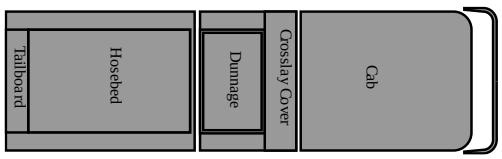
An alternate method of charging EV apparatus is to install a micro-grid. This is a dedicated renewable energy source (solar, wind, etc.) that produces direct current. This power is used to charge a bank of batteries. The battery bank is then used to recharge the EV apparatus. This method has the advantage of using renewable energy as well as being very efficient with the power. For the solar case, the cell output is DC, the battery storage is DC, and the recharging current is DC, so there is no conversion loss to consider. If your department wishes to consider a micro-grid you can learn more by contacting Command Consulting LLC.

COMMAND CONSULTING, L.L.C
SOLUTIONS THAT WORK

Command Consulting LLC
Wadsworth, Ohio
330-620-2048
Michael Benson, MPA EFO michael@commandconsultingllc.com
Robert Pursley, PhD EFO robert@commandconsultingllc.com





DC

Battery Storage

DC

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