

Basic Maintenance & Troubleshooting

Webinar Presenter – Ash Dalal

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Ohm Electric Cars

More than 20 years of hybrid, plug-in hybrid and battery-electric vehicle experience from basic to advanced:

- Basic maintenance / car restorations
- Battery / motor integrations
- Power Management Equipment
- Electronic Controls
- Mechanical & Electronic Design
- Modeling
- Simulations





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Basic Maintenance & Troubleshooting Outline



Outline

- What effects EV performance?
- Basic Maintenance & Troubleshooting:
 - Common Inspection Points
 - Frequently encountered maintenance issues
- “What if....”
 - Vehicle won’t fully charge?
 - Regen braking under performing or not performing

Q&A



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Common Inspection Points



What Effects EV Performance?



Weather: Cold / Hot Conditions may alter:

- Battery capacity: Expected mileage range
- Discharge performance: Acceleration / Braking
- Charge performance: Battery ability to absorb energy when cold / hot



Environment: Environmental conditions may alter performance, including:

- Wind : Excess drag
- Dust / Dirt : Aerodynamics / cooling
- Moisture : Electrical grounding / connections



Vehicle Health: Vehicle expected range vary over time due to:

- Battery health / maintenance
- Vehicle Maintenance



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Common Inspection Points



Promoting Vehicle Health

Tips for inspecting your EV:

- 1) Owner's manual – Learn vehicle specific inspection points

Electrical Connectors / Grounds

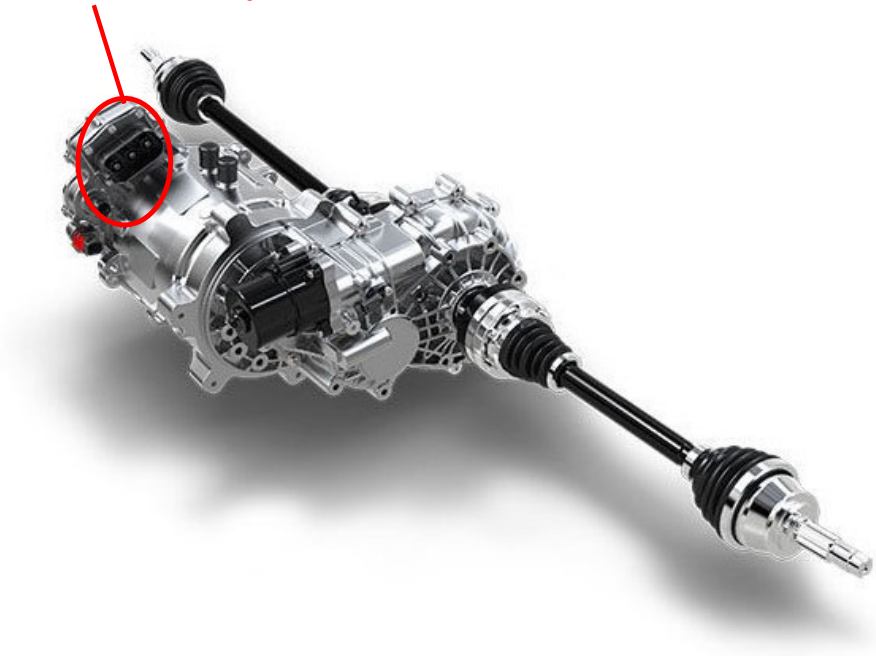


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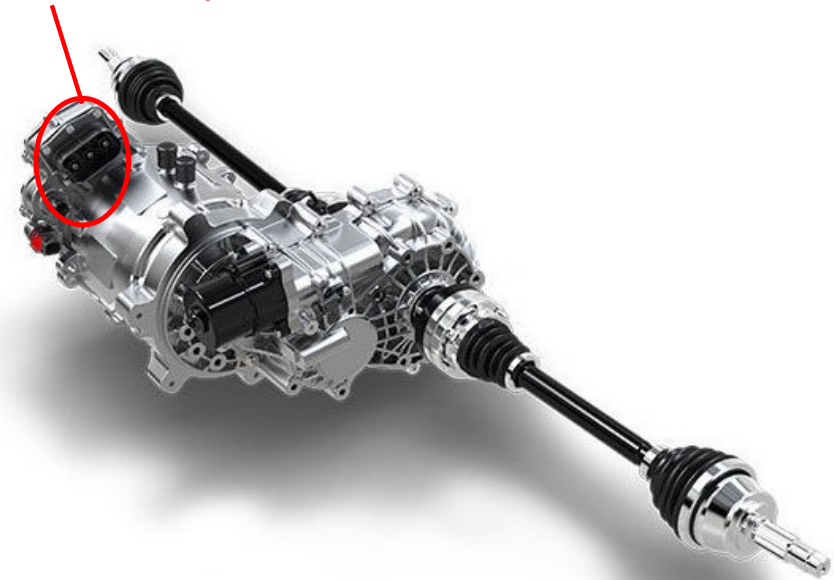


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Electrical Connectors / Grounds

Coolant hoses /
Connections / Fluid Levels

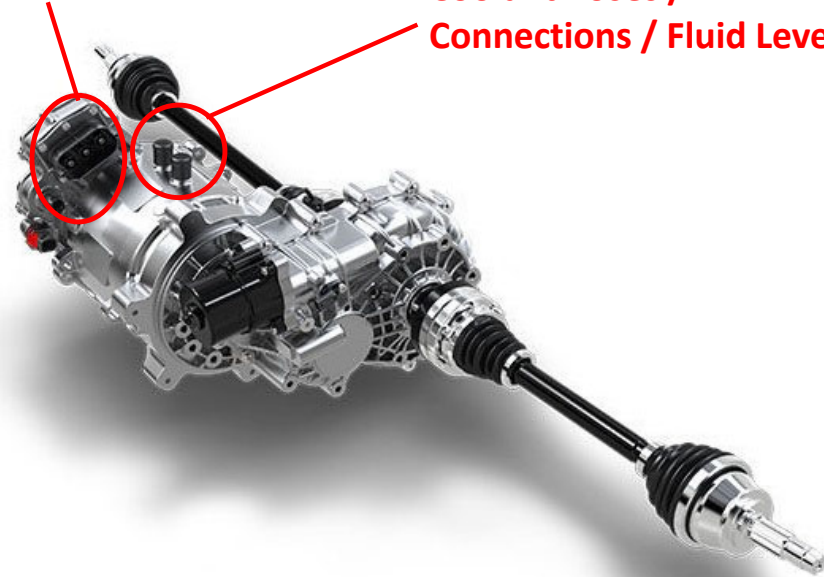


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Electrical Connectors / Grounds

Coolant hoses /
Connections / Fluid Levels

Bearings/Seals

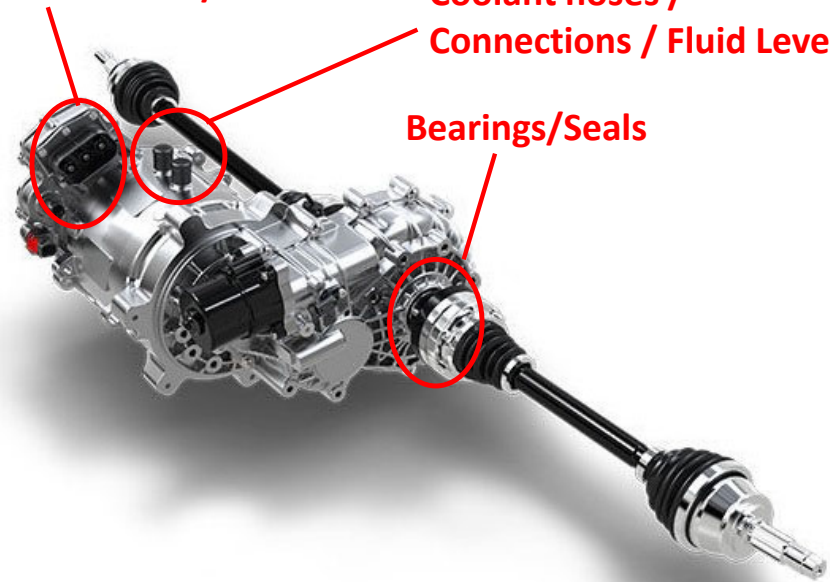


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Promoting Vehicle Health Tips for inspecting your EV:

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Gearbox oil leaking can create a "whine" or continuous sound while driving

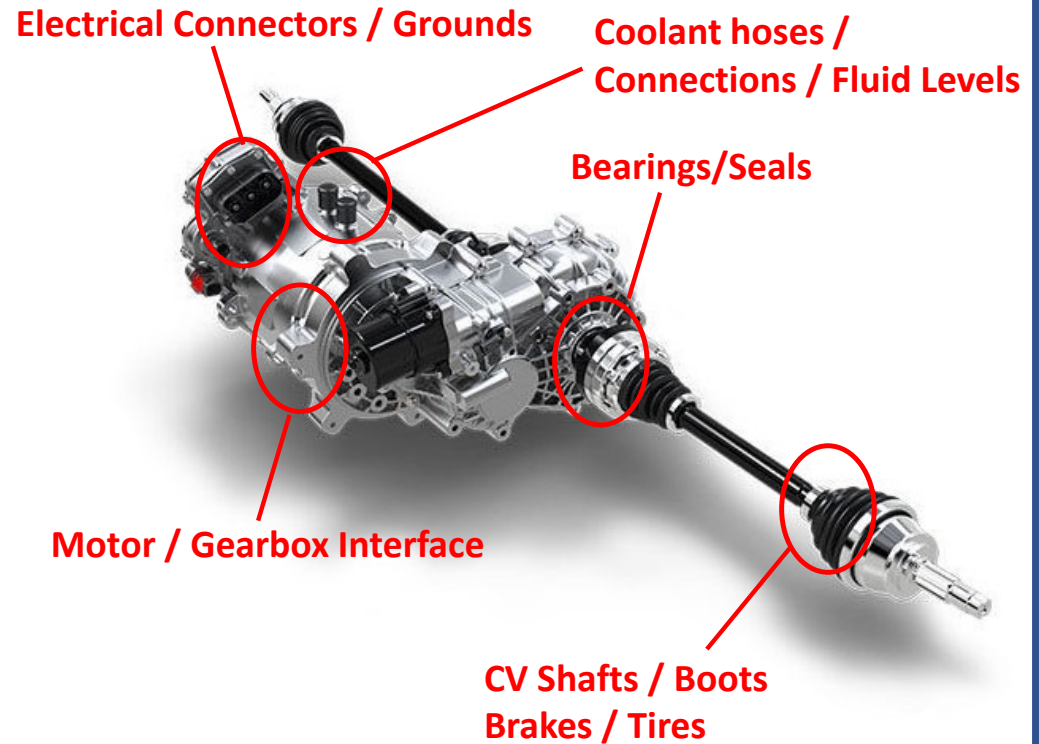


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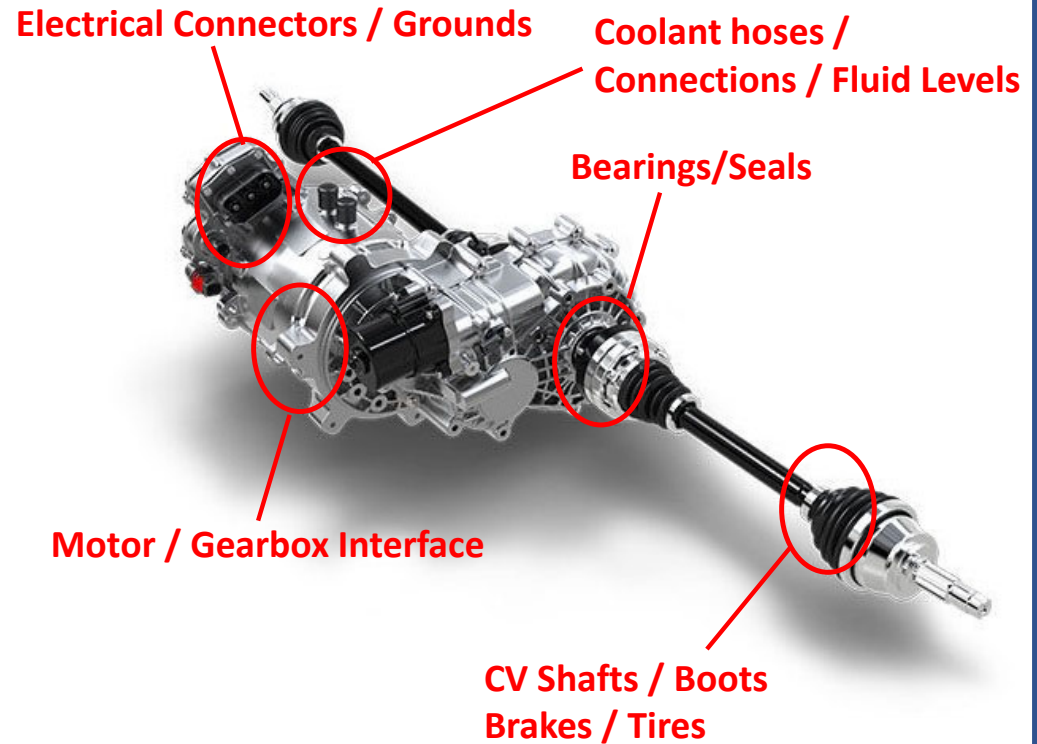


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- 3) Brakes – Check fluids / moisture accumulation, pads / rotors

Electrical Connectors / Grounds

Coolant hoses /
Connections / Fluid Levels

Bearings/Seals

Motor / Gearbox Interface

CV Shafts / Boots
Brakes / Tires

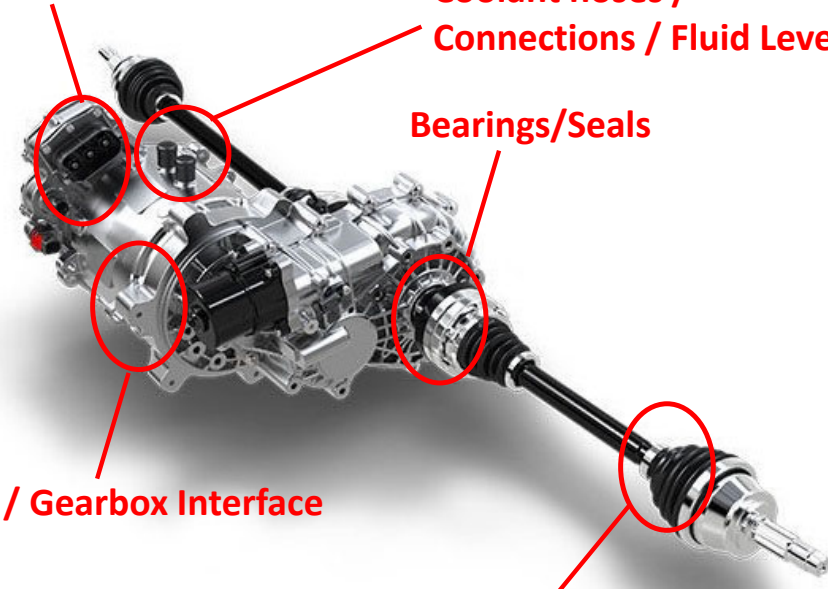


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- 4) Driveline/Suspension - CV Shafts, bushings

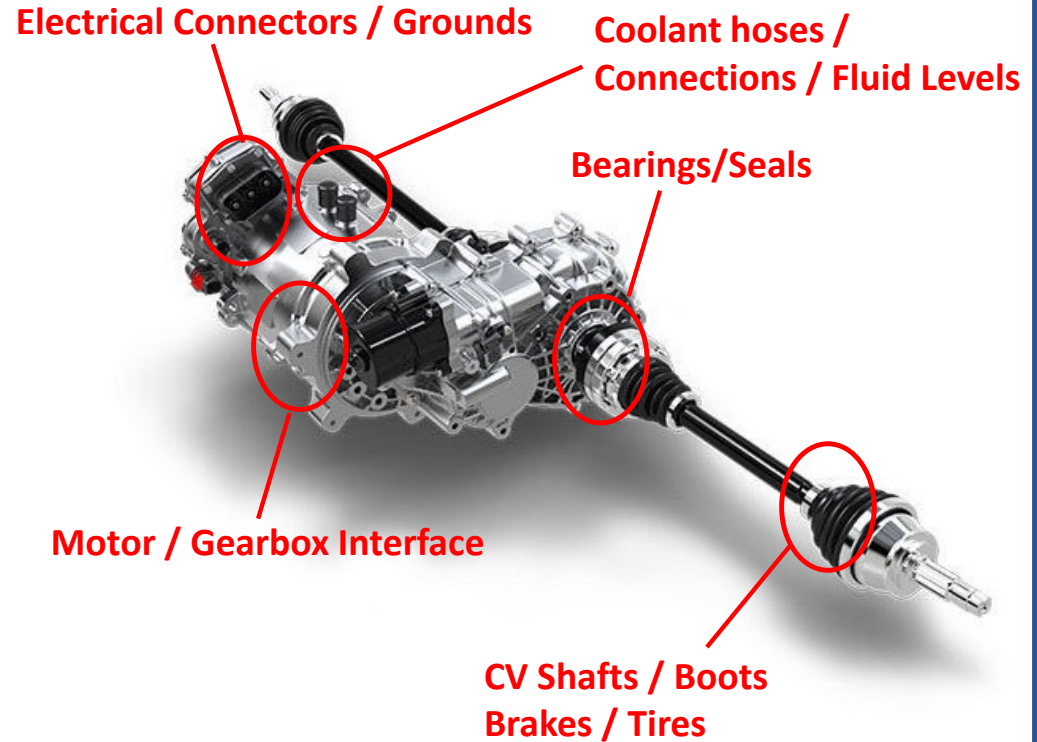


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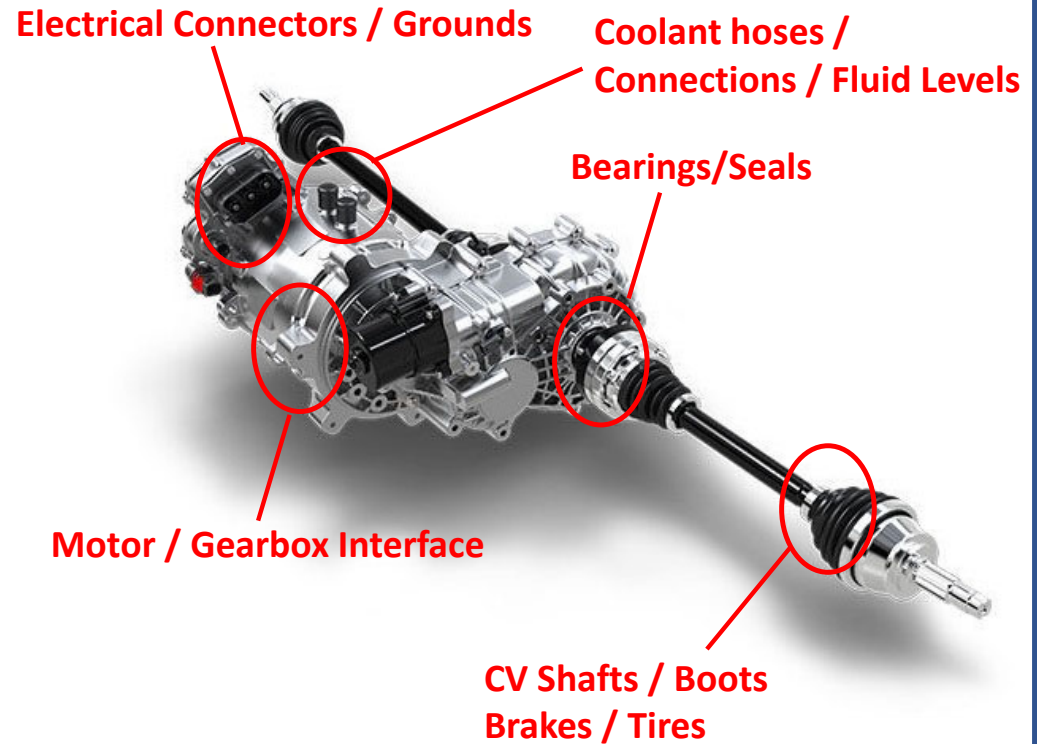


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- 6) Excessive dirt / mud – “Squeeks/Noise”

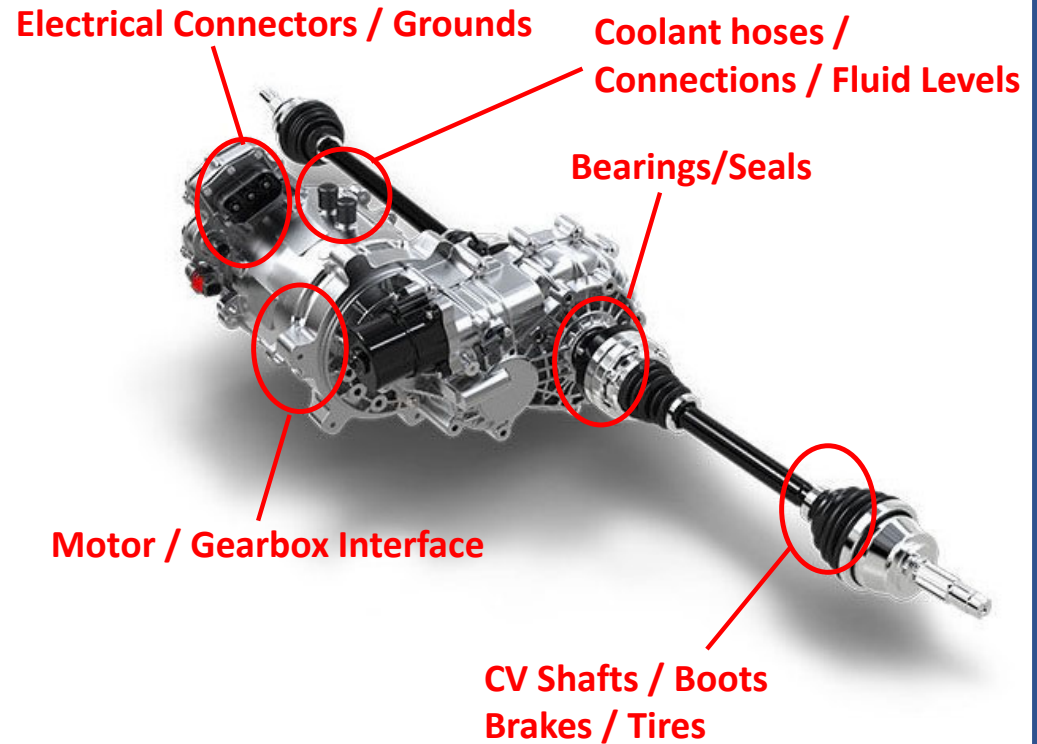


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- 7) Tires – Alignment / Tire Pressure

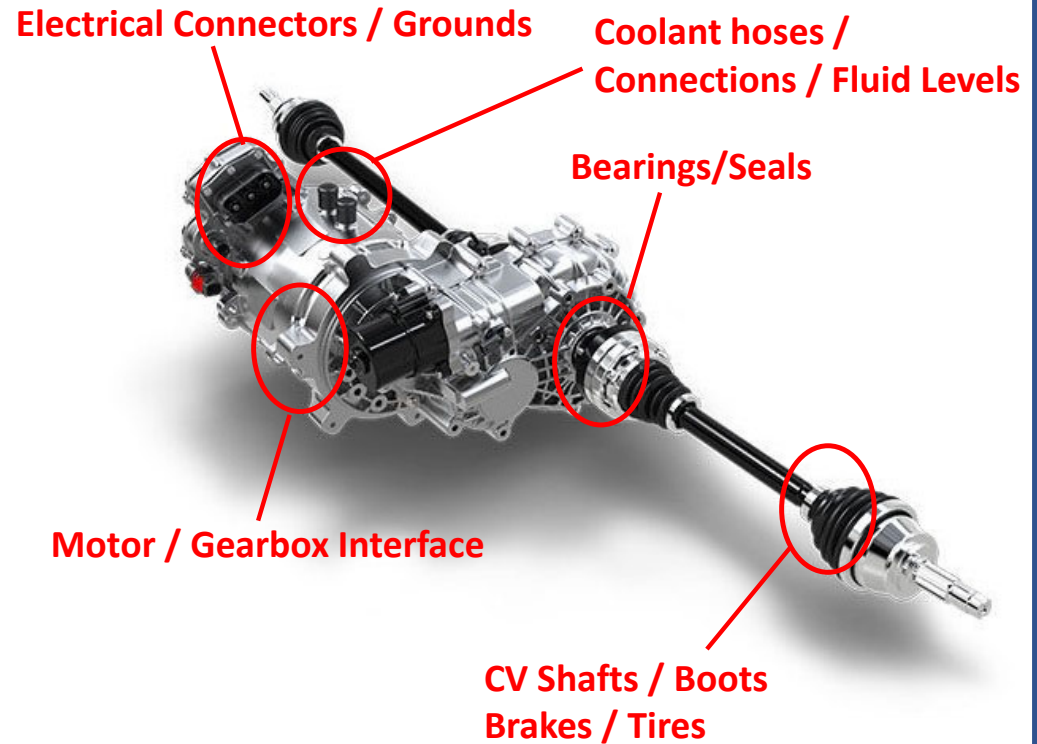


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Frequently encountered maintenance issues



Common misconceptions with electric and hybrid electric (EV/HEV) vehicles:

"I don't use my brakes – I regen!"

Wrong! EV/HEV still need to have brakes and tires inspected frequently for safety and efficiency as they drive on the same roads as gas/diesel cars

"Once I own an EV, I'll have zero maintenance!"

Wrong! EV/HEV also need the same amount of attention as gas/diesel cars, only differing inspection points and criteria

"These batteries don't need to be maintained"

Wrong! Consult owner's manual for recommendations for each vehicle. Some may require full Depth of Discharge (DoD) more frequently, or infrequent fast charging to promote longevity and overall performance / health.

Don't forget your 12V Chassis battery! – Still used for lights, radio, cab comfort



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Basic Maintenance & Troubleshooting

“What if...?”



“What if my vehicle doesn’t fully charge?”

Vehicle charge performance is dependent on variables:

- Environmental:
 - Cold / Hot Batteries will impact day-to-day battery performance
 - Community / home charging network grounding

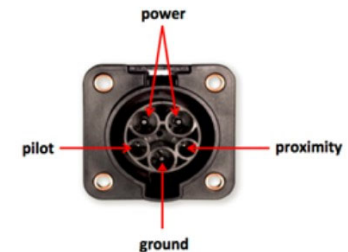
- Physical:
 - EV/HEV charging is accomplished through the “J1772” charging standard:

“Control Pilot” checks if:

- Vehicle is present and connected
- Communicates with vehicle of charge current and if capable of charging
- Car / EVSE have grounding
- Ensures vehicle can ventilate

“Proximity” checks if:

- Ensures physical connection between EVSE and vehicle are latched and in place
- No physical or visual issues with contacts



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“What if....?”



“What if my vehicle doesn’t fully charge?”

Vehicle charge performance is dependent on variables:

- Physical:

- Ensure fuse / breaker is functioning
(Cycle if necessary)
- Ensure no additional loads are on EV charge circuit

Level 1: 120VAC @ 12A

Level 2: 208-240VAC @ 30-50A

- When installing new EVSE:
 - Ensure lengths are minimized to reduce voltage drops
 - Impacts proximity/pilot
 - Dedicated breaker / meter



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“What if....?”



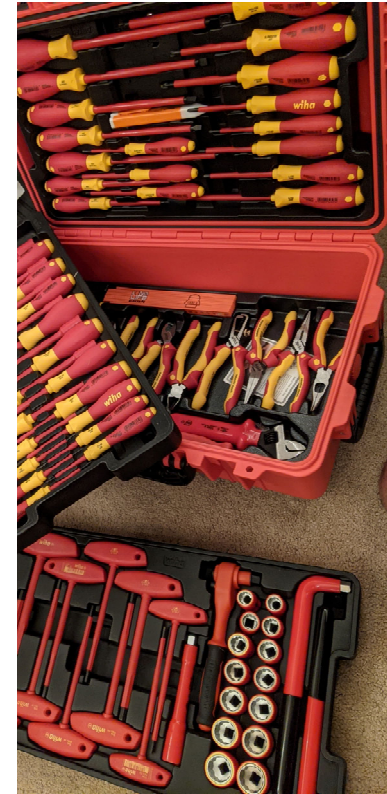
“What if my vehicle doesn’t fully charge?”

Vehicle charge performance is dependent on variables:

- Battery health

- Usage: Infrequent or incomplete charging
- Mileage: Degradation from age/mileage
- Vehicle hardware
 - Defective measurements
 - Damaged power electronics
 - Software / hardware updates from OEM

Under no circumstance should anybody attempt to service their EV/HEV without the proper safety tools and equipment!



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“What if....?”



“My Regenerative brakes aren’t working?”

- Regenerative braking will “always” occur due to nature of electric motor. The question is how well and how efficient does it work each time.

- Vehicle regeneration performance is dependent on same variables:
 - Environmental :
 - Cold / Hot battery temps can impact discharge / charge performance of vehicle battery

 - Physical :
 - Corrosion or dirt along rotating components producing added physical resistance.
 - Internal hardware / software issues – addressed by servicing or dealer inspection

 - Battery health :
 - Compare against average plug-in charge times, vehicle mileage, range changes.
 - Normal degradation of battery = 20% @ ~100k miles



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“What if....?”



Questions or Comments?



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