

# ***Tips on EV maintenance .....and on how to purchase a used one!***



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# Overview

## 1) *EV Maintenance*

- How to prepare with safety in mind
- Visual inspection points
  - What's under the hood
  - What's underneath the car
  - On the outside
  - Best Practices

## 2) *Tips on Buying a Used EV*

- *Are they for me?*
- CARFAX / Visual Inspections / OBD
- Wear / Tear Patterns
- Drive Test
- Original Equipment

## 3) *Summary*

## 4) *Q&A*



# EV Maintenance - Safety

- 1) Owner's manual
  - Maintenance / inspection points
  - Warning Labels
  - Frequency of inspections
  - Specific fluids
  
- 2) Let it cool!
  - Burn potential
  - Inaccurate readings
  
- 3) Equipment
  - PPE
  - Level ground
  - Jack / Jack stands



# EV Maintenance – What's Under the Hood

- 1) Warning flags / Orange Cabling
  - First Responders
  - High Voltage / High Current
  
- 2) Coolant Reservoirs
  - Levels within specifications
  - Connected hoses
    - Cracks / Dryness – Vehicles that sit / in heat
    - Dry coolant marks
  - Power Electronics
    - Check connectors for leaks / dry coolant
  
- 3) Brake Fluid Reservoirs
  - Water / Moisture
  - Levels
  - Dirt / contaminants



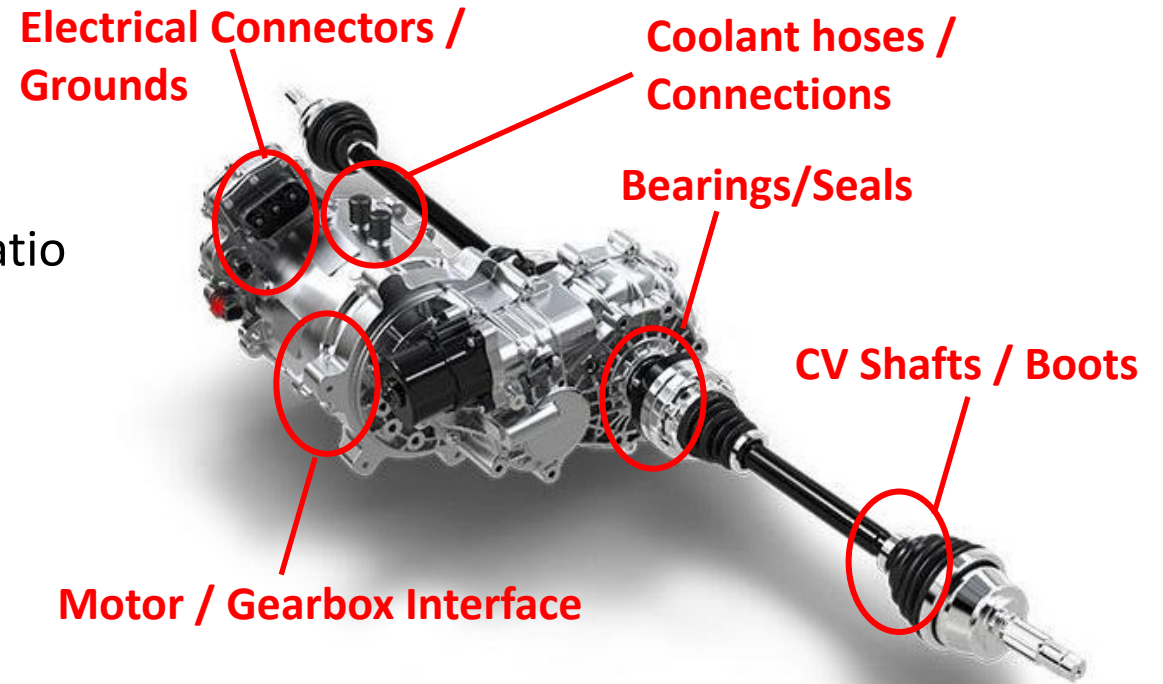
# EV Maintenance – What's Under The Car

## 1) Suspension / Steering

- Bushings
- Ball Joints / Tie Rods

## 2) Driveline

- Motor
  - Check seams for fluid leaks / mud accumulatio
  - Check dynamic seals
    - Noises
    - Leaks
- CV / Boots



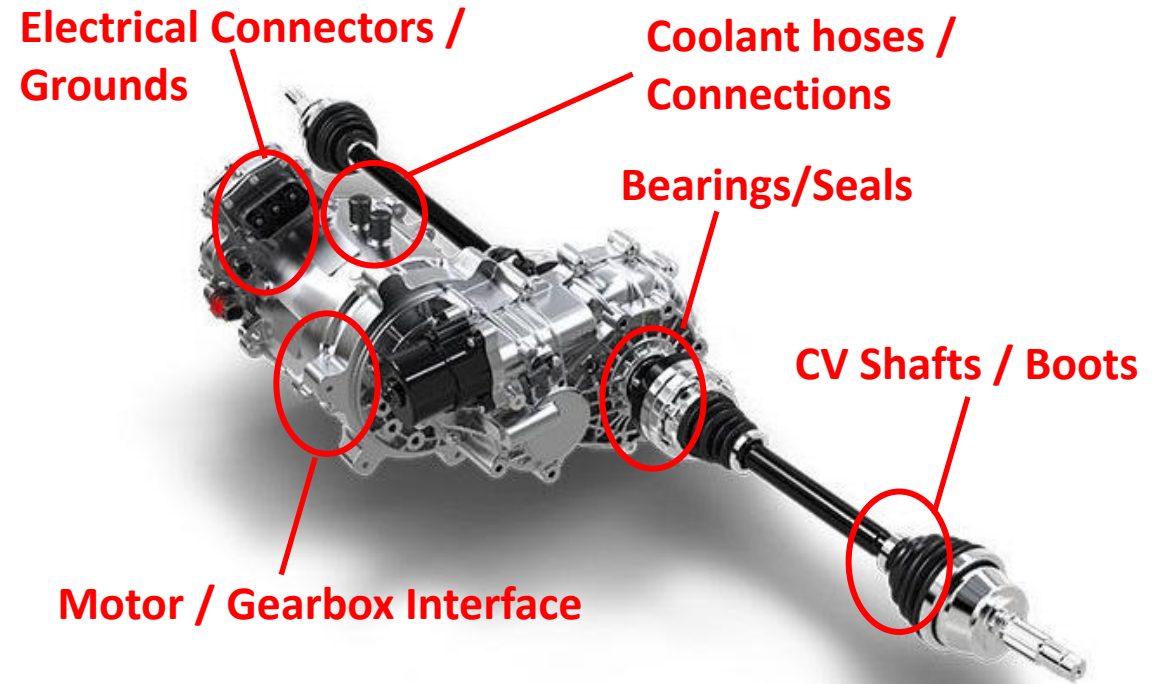
# EV Maintenance – What’s Under The Car

## 3) Connectors – “Connector-centric”

- Coolant Ports
  - Dry coolant / leaks
- Electrical Connectors
  - Position
  - Plastic condition
- Grounds, Grounds, Grounds!
  - Corrosion / Rust
  - Contamination

## 4) Brakes

- Even with Regen:
  - Check brake pads
  - Fluid Levels



# EV Maintenance – On the outside

- 1) ICE Engine Cars Turned EV:
  - Aerodynamic add-ons
    - Side skirts
    - “Underbelly” covers
    - Front / Rear air dam / spoiler
  - Ducts / Ventilation: Dirt / Mud
  
- 2) Tires - *“where the rubber hits the road”*
  - Low Rolling Resistance Tires:
    - Check Pressure
    - Check alignment
  - Follow rotation for non-staggered wheels



# EV Maintenance – Best Practices

- 1) Follow Owner's Manual for Charging Frequency
  - “Always on” – may require plug-in
  - Unique battery management
  - 12V chassis battery support
    - Long term storage
  
- 2) Follow a traditional ICE Engine plan:
  - EV's do need similar inspection / maintenance
    - Tires / Brakes / Suspension
  - Fluids – 3 to 6 months based on driving / weather
  - Connectors / Grounds : Look, but don't touch!
  - Seals / Bearings





# Used EV's– Are they for me?

- 1) Great alternative to your ICE
  - Potential lower cost of ownership
  - Great selection of used / lease returns to meet consumer needs
    - Sedans / SUVs / City
- 2) Understand your driving cycle
  - Primarily freeway driving? City driving?
  - How much fuel do you consume vs. electricity
  - Determine ideal battery pack capacity range
- 3) Understand your resources
  - Dedicated outlet / breaker for Level 1 / Level 2 Charging
  - Utility incentives
- 4) The things you didn't think about:
  - Vehicle / home insurance
  - Service access / support



# Used EV's– Inspections

- 1) Know your source
  - Auction: *May have missing or equipment*
  - Lease Return / Dealership: *Access to service tools*
  - Private party: *Trust!*
  
- 2) CARFAX
  - All vehicles >~'85
  - Vital service / repair work
  - Title clouds / owner history
  
- 3) Visual inspection
  - Tires: Mismatched brands / condition
  - Paint differences between panels
  - Misaligned panels – signs of accidents
  
- 4) OBD: On-Board Diagnostics
  - Freeway vs. City driving correlates to cycle counts on battery
  - Factory service tool can gather proprietary info:
    - Battery health
    - Degradation



# Used EV's– Wear / Tear

- 1) Driver seat wear
  - High use cases generally represent cases where drivers come in / out of vehicles, common in city driving atmospheres
    - Could factor into general battery health
    - General trigger to check the maintenance of brakes / tires
- 2) Software
  - Manufacturers frequently update electric vehicle software. It is important to make sure all service updates have been completed
- 3) Charge tests
  - Perform plug – in charge, to determine operation or any issues
    - 5-10 minutes: Strike up a conversation while watching any vehicle displays of any errors in your peripheral vision. Ensure any contactors engage and EVSE is operational
- 5) Operation of all accessories:
  - Check operation of all power accessories, radios, A/C, Heat, Windows, Doorlocks. Defrosters, lights/highbeams, any special creature comforts/options

*(\*-based on observations of buying many, many, many cars)*



# Used EV's– Drive Test

## 1) Parking Lot

- Lock to Lock turn test:
  - *Determine if any unusual sounds from CV / Driveline*
  - *Condition of steering components*
- Acceleration: Safely check for any whining or high-pitched noises
  - *Representative of worn seal, low fluid*
  - *Bearing damage from heat*



# Used EV's– Drive Test

## 2) On the Road –

- Lots of sounds!
  - **Tires:** Any “humming” or noticeable noises could be imbalanced or low pressure, resulting in uneven wear (common with non-staggered)
  - **Seals:** As you drive, listen to any wind noises. If you hear anything, check condition of seals around the area
    - Doors, windows, sun/moonroofs, tailgates
    - **Could also allow for moisture if seal is compromised. Check for any moisture accumulation.**
  - **Linings / air deflectors:** If you hear any excessive rocks hitting the wheel well, or undercarriage, when safely pulled over:
    - Check for condition / loose / missing panels or guards – which may be used to direct air to critical components like batteries / brakes
    - Check for excessive mud / dirt, as these could also block air passages



# Used EV's– Drive Test

## 2) On the Road –

- Lots of sounds!
  - ***Bearings / Seals:*** *Like your engine, your electric motor / gearbox has sensitive seals and bearings, which if damaged, can result in:*
    - *High pitched sounds while accelerating*
    - *Wobbly feel or sporadic sounds*

### ***If not repaired or assessed:***

- *Extensive damage to gears / motors from heat damage / no lubrication*
- *Contamination from dust / dirt*
- *\$\$\$\$\$ and TIME!*



# Used EV's– Drive Test

## 3) Extended Freeway / City Driving -

- *Observe any rapid loss of available mileage*
  - *High current discharges may alter capacity, factor of health*
- *Torque = “Hey, check out what happens when I stomp the pedal!”*

### ***If you really want to nerd-out***

*Take Before / Alter measurements:*

- *Odometer*
- *Battery State of Charge (%)*
- *Estimated mileage range*

*Take Values to determine “true” range, to compare with your requirements.*



# Used EV's– Original Equipment

1) Based on the vehicle source:

- *Check for any potential hardware that the vehicle came with from the factory:*
  - *EVSE: Electric Vehicle Supply Equipment (Level 1)*
  - *Tire Repair*
  - *Safety Equipment*
  - *GPS / Removeable electronics*
  - *Owner's Manual*

2) Extended / 3<sup>rd</sup> party / transfer of warranty





# Summary: Maintenance

- 1) **Owner's manual**
- 2) **Coolant Levels**
- 3) **Brake fluids / moisture accumulation**
- 4) **Driveline/Suspension: CV Shafts, bushings, brake pads**
- 5) **Driveline bearings / seals**
- 6) **Excessive dirt / mud**



# Summary: How to Buy a Used EV

- 1) Carfax
- 2) General wear and tear
- 3) Visual Inspections
- 4) Unusual road / wind noises
- 5) Driveline noises: Bearings / seals
- 6) Battery Health
- 7) Recalls / Service Bulletins have been addressed
- 8) Factory hardware (J1772 EVSE, etc) have been retained
- 9) 3<sup>rd</sup> Party or Dealer Provided Warranty: Make sure critical parts like battery and drive system are covered



# Q&A

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YouTube:

**The ADHD Shop: Always Dreaming, Hardly Driving**



Sac EV...

...Plug In and Drive

