













EMI/RFI Shielding Considerations for Electric Vehicles

Electromagnetic interference (EMI) and radio frequency interference (RFI) refer to unwanted electrical disturbances generated from adjacent electrical components or external sources. Depending on the application, inadequate EMI/RFI shielding can lead to issues ranging from slightly inconvenient obstructions to permanent and costly component failures. EMI and RFI shielding help to reduce the potential negative effects of electromagnetic and radio frequency waves.

EMI and RFI shields can be as simple as a gasket or as complex as a full shielding enclosure. EMI/RFI shielding is incorporated into a variety of products and industries, including:

 Aerospace Equipment	 Automotive Equipment	 Communication Equipment
 Computers	 Medical Devices & Equipment	 Industrial Control Systems
 Commercial & Residential Appliances	 Military & Defense Equipment	
 Heavy-Duty Vehicles & Equipment	 Mass Transit & Railroad Systems	

EMI is particularly problematic for automotive makers who are expanding into the electric vehicle (EV) market. With complex electronics systems in close proximity to high-powered batteries and voltage systems, there is a greater potential for electronic data corruption and even a complete breakdown of EV operations. To prevent this, auto manufacturers have begun to incorporate a variety of specialized EMI and RFI shielding methods tailored to the particular needs of EV equipment.



How EMI/RFI Shields Are Used in Electric Vehicles

EMI/RFI shields for electric vehicles are increasingly critical for safe, reliable vehicle operation. From GPS navigation to safety features, even non-electric vehicles are incorporating electronics into every aspect of their operation. As electronic usage increases, so too does the potential for dangerous electromagnetic interference.

For electric vehicles, the potential negative effects of inadequate EMI and RFI shielding are compounded by the presence of EV batteries and high voltage cables. The ignition, safety, communication, and infotainment systems in electric vehicles require electromagnetic signals to function correctly. Exposure to the wrong signals can compromise the operation of these systems. Strong electromagnetic energy is generated naturally by the battery, charger, and engine of an electric vehicle, and that energy can easily create conflicting signals that interrupt critical operations.

These complications can effectively be remedied through the use of effective EMI/RFI shielding for electric vehicles. Shielding methods can protect electronics from the internal magnetic field generated by the battery and charger, as well as external magnetic interference from other unshielded vehicles. EMI shields are specifically engineered to protect the following:

- Power Cable Connectors
- Power Inverter & Converter Covers
- In-Vehicle Electronics
- Infotainment & GPS Systems
- Advanced Driver Assistance & Safety Features
- Battery Packs & Battery Housings

Choosing the Right EMI/RFI Shield

When selecting the right EMI and RFI shielding strategy for electric vehicles, manufacturers must consider the location of the shield and what sort of shielding is necessary. To ensure the safety of EV operators and passengers, auto manufactures should prioritize EMI/RFI shielding early in the design process, during the design phase of the electronic components themselves. This also prevents the discovery of EMI problems on the assembly line, where shielding solutions are more costly and take up more space. Using high-quality shielding materials is paramount to success, and the most effective EMI shielding methods are tailored to the specific needs of each application.

Shielding Types and Materials

Since electric vehicles are exposed to various elements, it's important to not only select a shielding method that provides effective protection from EMI and RFI, but one that also seals and protects EV electronics from the environment, dust, dirt, fluids, and debris. Various types of shielding types are available, including:

Metal shields and cages. Metal shields and cages provide a physical barrier between circuits and surrounding systems. These shields reflect or absorb waves to significantly reduce interference. Implementing protective enclosures around EV batteries, engine cables, circuits, and other electrical systems decreases the risk of interference between systems, avoiding subsequent issues. Depending on where they will be used, shields can be made from solid metal, metal mesh, or metal with holes.

When it comes to creating effective EMI shields, various metal materials can be used. When selecting the best shielding material, it's important to consider factors such as cost, operating frequency, corrosion resistance, flatness, solderability, electrical requirements, space and weight constraints, and more. Common material options include:



Copper

Copper offers extremely reliable EMI and RFI protection. Compared to other material options, copper is very effective for attenuating magnetic and electrical waves.

Nickel Silver

Nickel silver is non-magnetic and offers excellent corrosion resistance. It is especially useful for shielding high frequency ranges.

Tin-Plated Steel

This material is cost effective and is ideal for shielding low frequency ranges. Steel corrodes easily; therefore, a tin coating is added to mitigate corrosion. Tin also improves the shield's solderability.

EMI/RFI Shielding Services from CEP Technologies

In the complex, ever-changing electric vehicle industry, you need an EMI/RFI shielding manufacturer with extensive experience in the manufacturing of custom shielding solutions for complex and innovative projects.

CEP's extensive experience in the manufacturing of custom EMI/RFI shields allows us to work with your design team to assist in dimensioning and tolerancing and raw material selection in order to provide a cost effective and efficient solution.

That's where CEP Technologies can help. At CEP Technologies, our seasoned experts our seasoned experts have the hands-on experience and in-depth knowledge necessary to create effective solutions to the unprecedented challenges faced by the EV industry.

We manufacture superior quality metal stamped components, including custom EMI/RFI shielding for customers in a wide range of industries. Our IATF 16949:2016 certified operation produces precision metal shielding components in a wide range of materials, including copper, brass, nickel, silver, steel, tin, and more. Each of our products is manufactured to the customer provided specifications.

CEP specializes in miniature to small progressive die stampings. In addition, we provide specialty services, including rapid prototyping, barrel plating, deburring, e-coating, tape and reel packaging, and more.

To learn more about our EMI/RFI shielding capabilities for EVs, or to get started on your customized solution, [contact us](#), or [request a quote today](#).



About CEP Technologies

CEP Technologies Corporation (CEP) is an IATF 16949:2016 certified global high volume precision metal stamping company. CEP designs and builds progressive metal stamping tools to support global markets. Specializing in EMI/RFI Shielding, Press Fit Pins, and Electrical and Automotive components, CEP is your global source for miniature to small thin gauged progressive metal stampings. Raw materials include, but are not limited to, Low and High Carbon Steel, Coppers, High Performance Alloys, Brasses, Leaded Brasses, Tin Brasses, Phosphor Bronzes, Nickel Silvers, Precious Metals, and Stainless Steels. CEP offers value added services such as rapid prototyping, reel to reel and barrel plating, heat treating, washing, deburring, anodizing, e-coating, precious metal coatings, and tape and reel packaging.

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