

## **Electrical Systems**



*A lubrication guide for engineers who design automotive connectors, switches, and sensors*



# Electrical Systems



**They're taking over.** Drive-by-wire, comfort and positioning systems, even new power-train technologies — vehicle systems are increasingly managed by electrical devices. At the foundation of this quiet revolution are connectors, sensors, and switches — and the synthetic oils and greases that keep them functioning properly well after warranties expire.

In this brochure, we highlight some of what we've learned about the lubrication of automotive electrical components — knowledge that comes from working with OEMs and world-class Tier One suppliers. Use it early in the design process to think about the best lubricant for your application. Then, call Nye for specific recommendations — for a SmartGrease™ that knows how you want your product to perform.

*Log-on to [NyeAutomotive.com](http://NyeAutomotive.com) for data sheets, MSDS, and more information about synthetic lubricants.*



**SmartGrease™**  
Synthetic lubricants designed for your product

# Electrical Systems

## Connectors

### Protecting Contacts

Contact lubricants are used to prevent wear, environmental corrosion and “fretting corrosion,” micro-motion caused by vibration and thermal changes within the connector housing. By reducing the formation of metal oxide at the mated interface, synthetic lubricants extend contact life and keep resistance low. *Nye suggests: NyoGel® 760 family of products*

### Gold-Plated Contacts

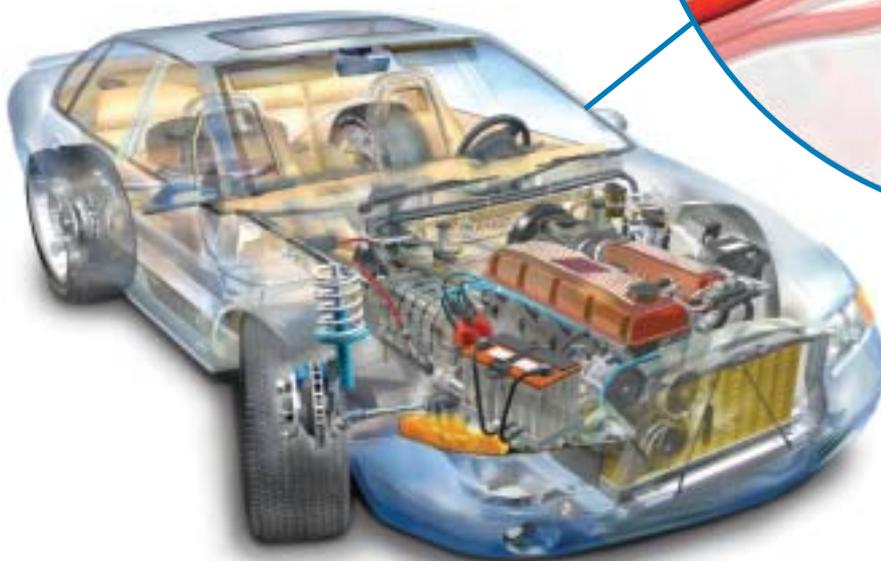
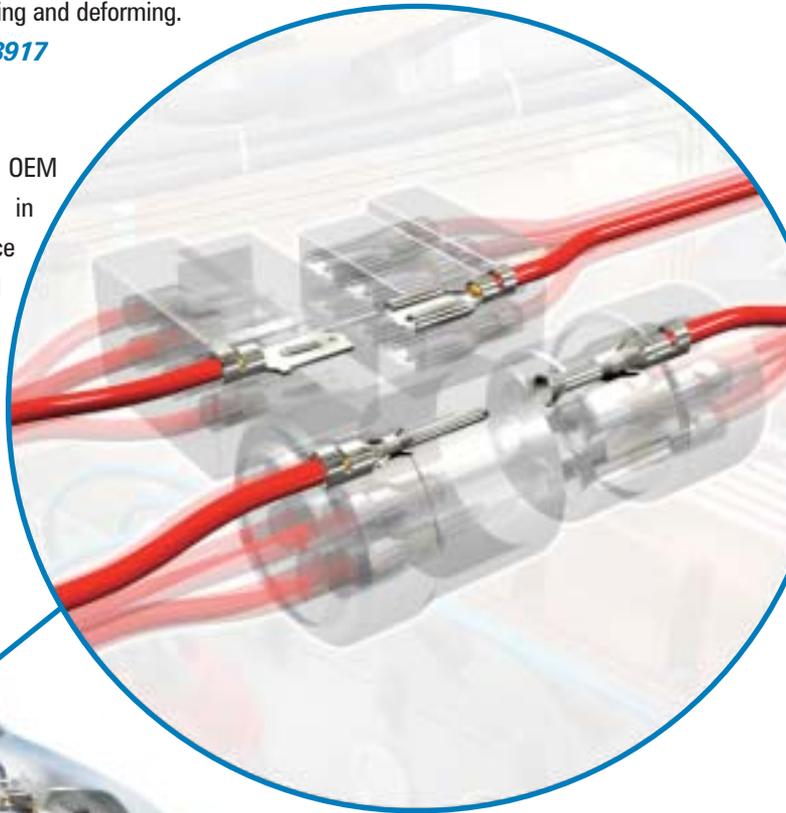
While silver- and tin-plated contacts are used in most automotive connectors, some connectors — in airbags, for example — have gold-plated contacts. Gold is soft. When mating, the plating may stick, gall and scratch, sometimes exposing the substrate to corrosion. The right synthetic lubricant reduces “stiction” and prevents galling, scratching and deforming.

*Nye suggests: NyeTact® 571H-25UV, UniFlor™ 8917*

### Insertion Force

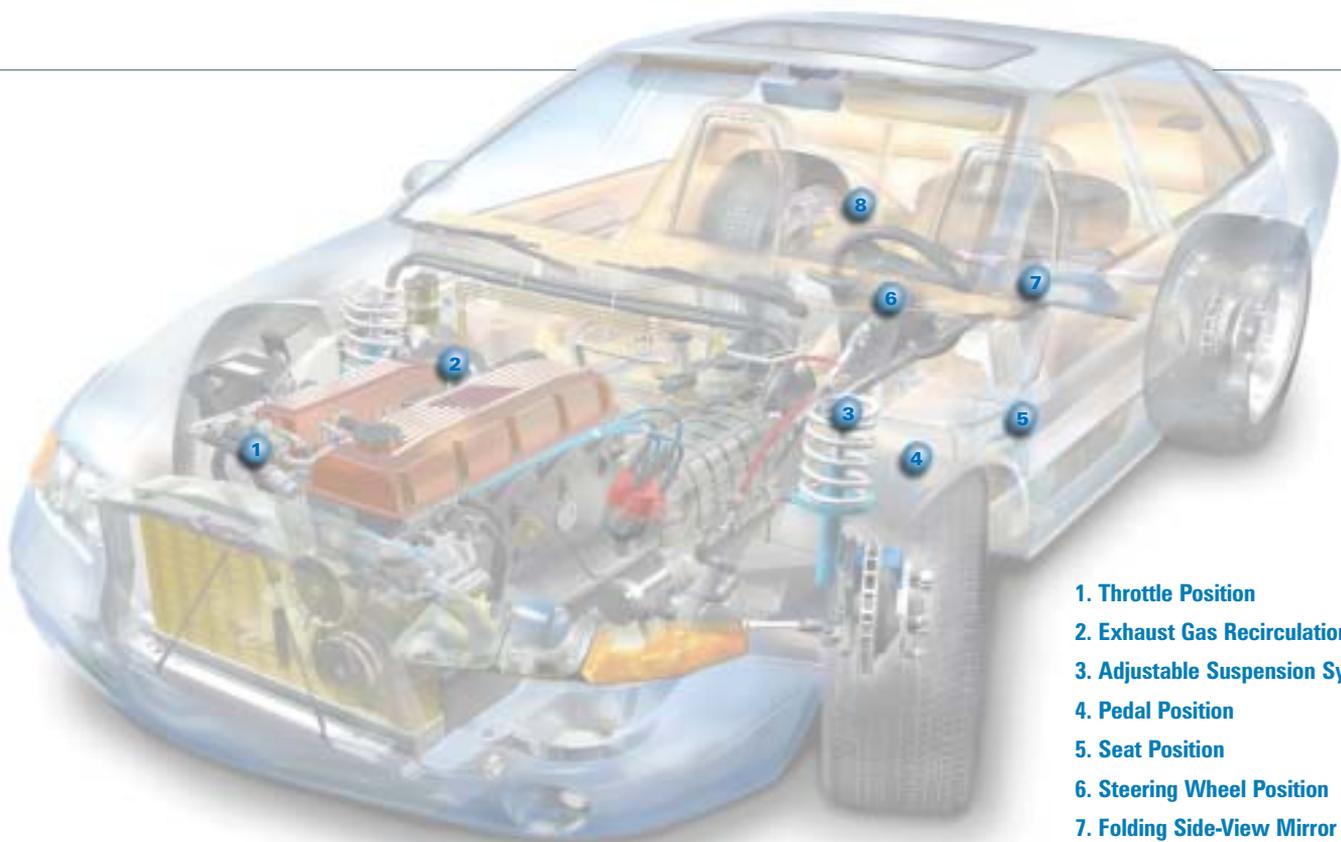
Insertion force reduction has also become a major OEM challenge. Mating multi-pin connectors, sometimes in difficult to reach locations, often requires significant force — creating the potential for incomplete mating as well as repetitive-motion injuries for assembly workers. Fluoroether-based synthetic lubricants have been proven to reduce high insertion forces — without unacceptable increases in resistance.

*Nye suggests: UniFlor™ 8917*



### Lubrication Tip

Virtually any contact grease can be formulated as a dispersion to accommodate manufacturing requirements.



1. Throttle Position
2. Exhaust Gas Recirculation (EGR)
3. Adjustable Suspension System
4. Pedal Position
5. Seat Position
6. Steering Wheel Position
7. Folding Side-View Mirror
8. Fuel Level

## Sensors

When electromechanical sensors or potentiometers break contact, signal is lost. To ensure continuous contact, choose a low-viscosity fluorinated or silicone oil. A more viscous oil may cause the contact to hydroplane, instead of remaining in contact with the resistor. Sensor lubricants should exhibit low viscosity at  $-40^{\circ}\text{C}$  and pour points should approach  $-90^{\circ}\text{C}$  to guard against lubricant thickening at low temperatures. *Nye suggests: Fluorocarbon Gel 813-1, UniFlor™ 8911*

Fuel level sensors represent a singular lubrication challenge given their turbulent environment. A 10% dispersion of a perfluoroether lubricant in a perfluoroalkane solvent, either dipped or brushed onto the surface of the contact, deposits a thin, uniform, long-lasting coating of grease across the resistive ink. *Nye suggests: NyeTact® 571H-10*

## Heavy-Duty Switches

Contacts in starters, headlamps, high-beams and other high-current switches are known for high-temperature arcing. Although they reach extreme temperatures for only a nanosecond, the copper tends to oxidize where the arc occurred. While no lubricant can survive arcing temperatures, glycol oils burn clean in the presence of an arc rather than leaving a resistive varnish. They do not form oxides that compromise electrical conductivity. *Nye suggests: NyoGel® 782G*

In the course of accelerated life testing, turn-signal switches may reach temperatures of  $150^{\circ}\text{C}$  or higher at the contact. Fluoroether-based lubricants have been shown to prevent wear and maintain signal strength in this environment. *Nye suggests: UniFlor™ 8981, UniFlor™ 8511*

## Medium-Duty Switches

Medium-duty switches accommodate loads in the 1–10 amp range. Applications include switches for exhaust fan speed, rear window defroster, and windshield wipers, as well as windows, seats, and door locks. A lithium-soap-thickened ester grease with a copper corrosion inhibitor is recommended. *Nye suggests: Rheolube™ 716A*

## Light-Duty Switches

Small switches with lightly loaded contacts often operate in extreme temperatures. To combat cold, a lithium-soap-thickened, synthetic hydrocarbon grease rated to -40°C is recommended. Where temperatures are expected to exceed 150°C, a medium-viscosity fluorinated grease has proven successful. *Nye suggests: Rheolube™ 362HT, NyeTact® 571H-10*

## Damping Greases

Mechanical damping greases improve the perceived quality of hand-operated mechanical switch components. These “sticky” greases absorb loose fits. The viscosity of these greases can be varied to give the switch a wide variety of acoustic and tactile characteristics. *Nye suggests: NyoGel® 774, Fluorocarbon Gel 868*

### Lubrication Tip

Specialty testing for temperature and resistivity can be used to pre-qualify a lubricant for electrical components.





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