MAKING SENSE OF VEHICLE CONTROL

Lucas Automative Ltd has created a new business unit to supply high-technology sensors to the automotive industry, as part of a move into the market for electronically controlled vehicle suspension, braking and chassis systems.

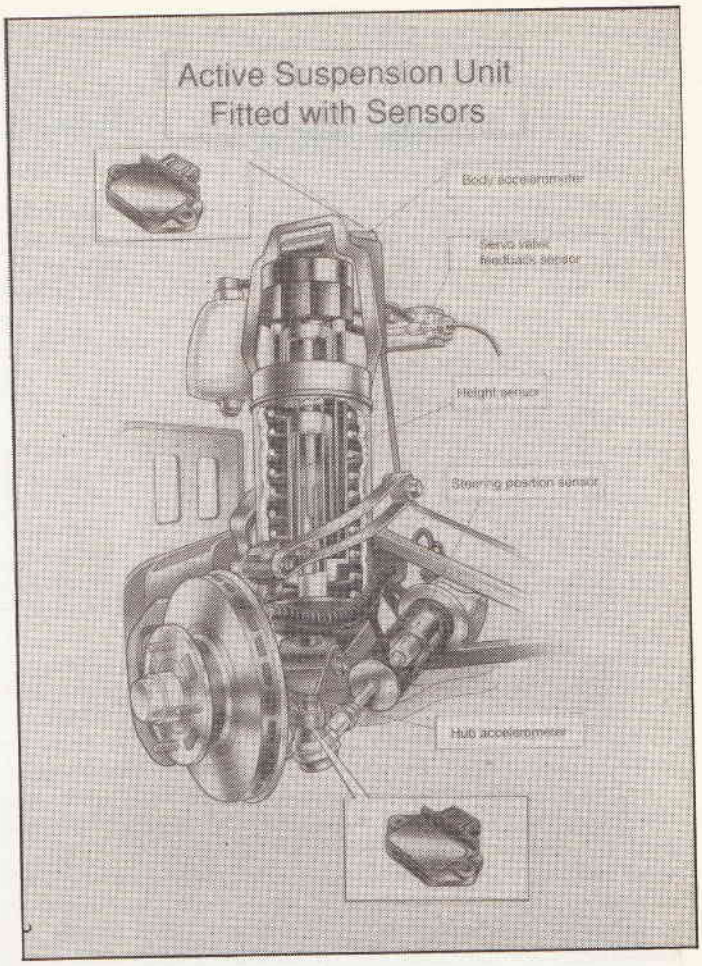
Vehicle control systems are made up of three elements — sensors, electronic control units (ECUs) and actuators. Many vehicles will have up to six separate ECUs to control separate functions.

Chassis system control covers the steering, suspension and braking control units, with sensors measuring position, speed or acceleration. An active suspension assembly at each corner will probably require up to five sensors — body accelerometer, height sensor, hub accelerometer, hydraulic servo-valve feedback sensor and load cell. There may be additional accelerometer and yaw rate sensors on the chassis.

Sophisticated electronic control needs rugged and accurate position sensors, both linear and rotational. The Lucas linear sensor operates in stroke lengths of 5mm to 500mm and can be used to control ride height, suspension, transmission, steering, clutch and seat position. The rotational sensor operates over a range of more than 100° and can be applied to steering position, ride-height control and rotary actuator position feedback. These non-contact sensors use an inductive circuit which incorporates sensing coils, driven by a high frequency oscillator, with a conductive "spoiler". Movement of the spoiler changes the amount of eddy current damping in proportion to the engagement of the coil and spoiler. The resulting inductance change provides a sensor output proportional to displacement. The "Digital Autoplex" interface IC is used to provide an output signal suited to automotive system use.

Speed sensors can be made in different technologies depending on the application. Lucas manufactures a variable reluctance speed sensor used in crankshaft speed/position applications; this unit may be adapted for use in advanced braking systems. The newly developed magneto-resistive wheel speed sensor provides a useful signal at near-zero wheel speed, with application in traction control and anti-skid braking. During the past two years an optical speed-over-ground sensor, using the technique of spatial filtering, has been developed and successfully tested under a wide range of climatic conditions for the measurement of absolute vehicle speed.

The introduction of accelerometers will give rise to the greatest innovation in control of vehicle suspensions. The silicon accelerometer sensing element consists of a micromachined silicon mass suspended by multiple beams from an external silicon frame. Stress-sensitive Piezo-resistors within the beams change their resistance as the motion of the suspended mass changes the stress in the beams. The associated circuitry processes this signal into that required by the vehicle's ECU system. Micromachined silicon technology provides the most versatile approach to low cost accelerometers.



LOW VOLTAGES, HIGH TECHNOLOGY

It's not just big companies that make outstanding technological acheivements. EM Electronics, a three person organisation, received a Queen's Award for Technology this year.

The company was formed in 1979 as a design consultancy, specialising in measurement of extremely low DC voltages. Following three years of research, EM Electronics developed a nanovoltmeter.

Subsequently the National Physical Laboratory required even lower levels of voltage measurement in for more accurate determination of the basic unit of electrical current, and so the first EM DC Picovoltmeter was produced. Later projects included the conversion of AC to DC for an amplifier which would detect very low levels and provide a high degree of linearity. EM measuring techniques can also be applied to the quantized Hall effect for accurate determination of basic resistance.

EM Electronics now produce a range of instruments which include detection down to a few picovolts, linearity to better than one part per million and a nanovoltmeter which, whilst remaining at room temperature, can efficiently measure a source at cryogenic temperatures.

For further information contact EM Electronics, telephone 0590 22934.