



Automotive Liquid Level Sensing

Product Training Module



Introduction

Purpose

- There are an increasing multitude of sensing applications in the automotive industry
- They improve vehicle safety and supply more intelligence



Introduction

Objectives

- Present the hermetically sealed reed sensor technology
- Define the key functions and key terms
- Present the automotive sensing needs
- Present the various package configurations
- Present the many applications

Key Terms – The Reed Sensor

- ❑ The reed sensor is composed of two key components: the reed switch and a magnet
- ❑ The reed switch may be directly mounted to a PCB or a connector
- ❑ The sensors are usually packaged in a plastic or metal housing
- ❑ Hundreds of different sizes and shapes

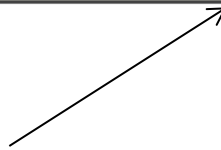


Key Terms – The Reed Switch

- The reed switch has two open contacts that are hermetically sealed in a glass cylinder
- The contacts are two ferromagnetic leads
- The two leads are separated internally forming a gap
- They come in various cylindrical sizes



Reed Switch



Key Terms – The Reed Switch

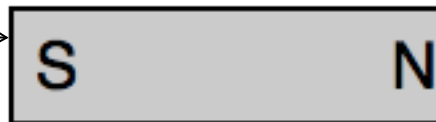
- Sensitivity to closure is measured in milli-Tesla (mT) or ampere turns (AT)
- The sensing distance may be adjusted for optimum closing and opening.
- Hysteresis is the ratio of the closure point divided by the opening point.
- Hysteresis is critical in some applications.



Key Terms – The Permanent Magnet

- Steady magnetic field
- Has a north and south pole
- Available in various sizes
- Available in different strengths
- Magnetic strength is measured in gauss or milliTesla
- Magnets come in different materials – rare earth, Alnico, and ferrite
- Rare earth are the strongest magnets

Permanent Magnet →





Why Reed Sensors for Automotive Applications?

Key Features

- Reed sensors ideal in harsh under-the-hood environments.
- Reed sensors offer remote sensing at distances greater than one inch (25.4 mm)
- Reed sensors do not require any power when they are in their off or un-energized state.



Why Reed Sensors for Automotive Applications?

Anywhere where sensing movement is necessary

Hood or trunk closure

Movement of the brake pedal

Door opening or closure

Key insertion

ABS brakes

Speedometers

Tachometers

Cruise control

Tire pressure sensing

Door ajar

Sun roof position

Gear selection

Emergency brake

Gas cap placement

Electric window position

Security system controls

Air bags

Fuel shut off

Shock sensor

Seat belt sensor

Door locks

Exhaust fumes emission control

Convertible roof end position



Why Reed Sensors for Automotive Applications?

Anywhere where liquid levels need to be monitored

Brake fluid

Oil level

Fuel level

Low fuel level

Windshield fluid level

Coolant fluid level

Transmission fluid



Automotive Applications

- Examine conditions of Automotive Application
- Select the sensing technology that is best suited for the application
 - ▣ Solid State Sensors
 - ▣ Mechanical Sensors
 - ▣ Reed Sensors
 - ▣ Inductive Sensors
 - ▣ Capacitive Sensors



Applications

Brake Fluid Sensor



Brake Fluid Sensor

Requirements

- Absolutely vital (life/death) requirement
- Quality and reliability critical
- Under the hood dirty environment



Brake Fluid Sensor

Requirements

- Operating temperature range (-55°C to 150°C)
- A wide hysteresis is needed.
- Ability to have the on-board computer know that the sensor is in the circuit



Brake Fluid Sensor Technology Selection

Reed Sensor Selected

- In this case, a float with an imbedded magnet is placed within the brake fluid
- The reed switch is housed in a plastic sealed package locked in place externally and under the brake fluid tank



Brake Fluid Sensor Technology Selection

Reed Sensor Selected

- When the brake fluid float is low enough the reed switch will activate.
- In turn an indicator light on the dashboard is turned on
- Turn off the ABS system



Why the Reed Sensor Was Selected for Brake Fluid Sensor

- The reed sensor is hermetically sealed and further contained in a sealed plastic package
- Not affected by the 'under the hood' environment
- It offers the best quality and reliability where it can operate for billions of operations
- Dynamic contact resistance testing (DCR)



Why the Reed Sensor Was Selected for Brake Fluid Sensor

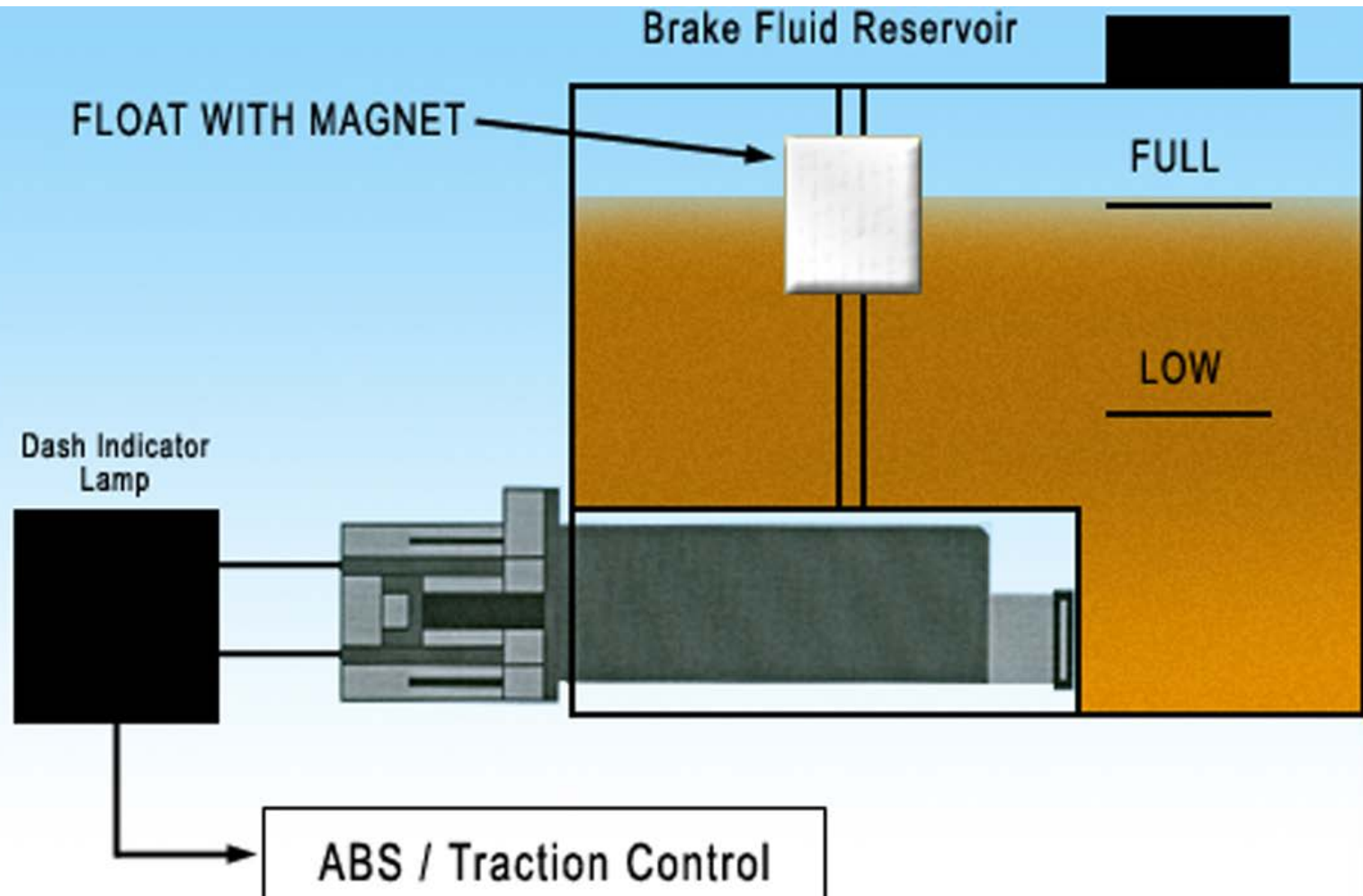
- Accurate open and closure points for reliable operation
- Ability to adjust the hysteresis which allows for a wide differential between closure and opening



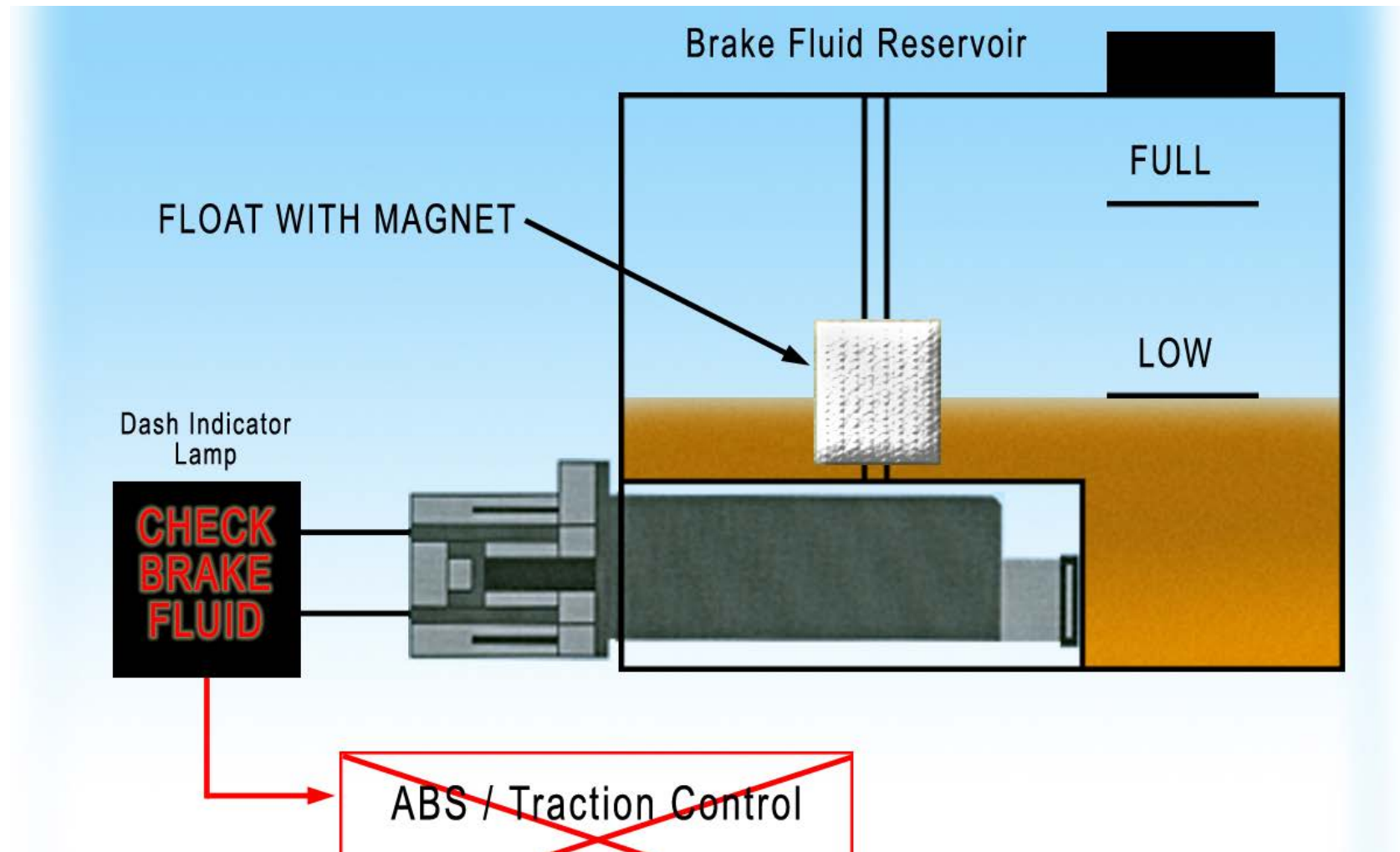
Why the Reed Sensor Was Selected for Brake Fluid Sensor

- Use of a PCB allows for a more reliable electrical connection approach
- High resistance resistor within the sensor used for monitoring

Why the Reed Sensor Was Selected for Brake Fluid Sensor



Why the Reed Sensor Was Selected for Brake Fluid Sensor





Applications

Brake Pedal Sensor



Brake Pedal Sensor

Requirements

- Another vital requirement
- Quality and reliability critical
- 100s of thousands of operations expected



Brake Pedal Sensor

Requirements

- Dirty sometimes wet environment
- Must have a rugged well sealed sensor
- Must have a long sensing distance.



Brake Pedal Sensor

Requirements

- Operating temperature range (-40°C to 60°C)
- The braking operation not only activates the brake shoes to slow down or stop the vehicle, but needs to activate the brake lights
- Also, the sensor must turn off the cruise control.



Why the Reed Sensor Was Selected for Brake Pedal Sensor

- Ability to operate in temperatures from -55°C to 150°C with no negative effects
- Ability to operate for 100's of thousands of operations reliably



Why the Reed Sensor Was Selected for Brake Pedal Sensor

- Accurate open and closure points for reliable operation
- Dynamic Contact resistance testing (DCR)



Applications

Window Washer Fluid Level Sensor

Window Washer Fluid Level Sensor

Requirements

- The window washing operation is considered a critical safety requirement
- Sensing fluid level therefore is critical
- Sensor quality and reliability a strong requirement

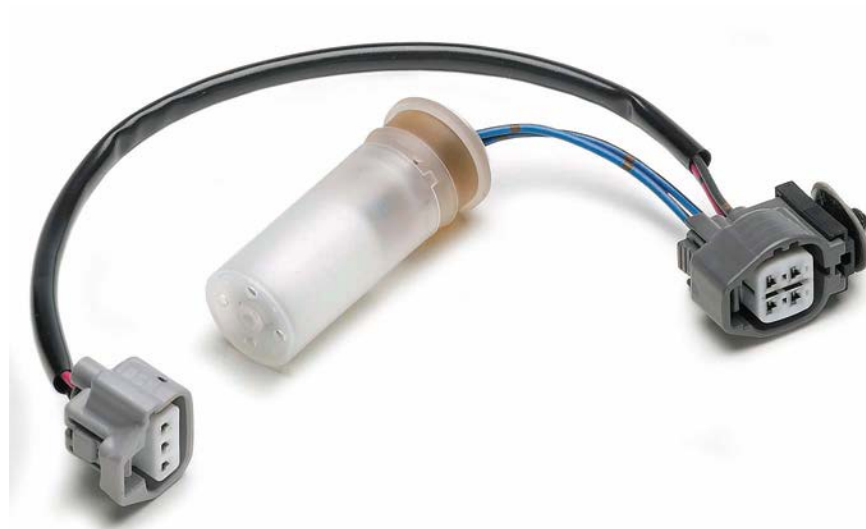




Window Washer Fluid Level Sensor

Requirements

- Dirty wet 'under the hood' environment
- Must operate -55°C to 150°C
- Must have a rugged well sealed sensor





Window Washer Fluid Level Sensor

Requirements

- Careful position of sensor away from the magnetic field of washer pump motor
- Sensor may be top, side or bottom, mounted depending upon the design of the fluid container
- Side mounting may require anti-rotation device
- Integrated automotive connector
- Sensor may need to incorporate the float mechanism as well as the sensing mechanism



Window Washer Fluid Level Sensor

Requirements

- Must have a wide differential or wide hysteresis to prevent rapid turn on and turn-off when the fluid is sloshing.
- Must be able to operate properly with different specific gravities





Window Washer Fluid Level Sensor

Requirements

- Ability to directly switch incandescent and led indicators and/or send the signals to a on board computer
- Capable of supplying an electrical signal to the on board computer that the sensor is properly electrically connected

Window Washer Fluid Level Technology Selection

Reed Sensor Selected

- Hermetically sealed reed switch technology
- A turnkey component
- Ability to switch higher power and low level digital signals



Why the Reed Sensor Was Selected for Window Washer Fluid Level

- A hermetically sealed reed sensor was selected to better deal with the wet, dirty ‘under the hood’ operating environment
- In addition, the reed switch is housed in a plastic sealed package
- The sensor and float can be locked in place on the fluid container



Why the Reed Sensor Was Selected for Window Washer Fluid Level

- Ability to operate in temperatures from -55°C to 150°C
- Ability to operate for 100's of millions of operations
- Dynamic Contact resistance testing (DCR)



Why the Reed Sensor Was Selected for Window Washer Fluid Level

- Accurate open and closure points for reliable operation
- Provide wide hysteresis
- Ability to meet different or changing specific gravities





Summary

- Each technology has its own best operating characteristics
- Reed sensors are the design-in choice when encountering wet, dirty, wide operating temperatures ranges
- Reed sensors continues to be selected for liquid level detection
- Those many applications listed earlier all use the reed sensors basically for the same reasons as presented in the detailed applications

PARTNER | SOLVE | DELIVER

For more information on our capabilities, and how we can partner, solve, and deliver to your needs, please visit us at www.standexmeder.com