

CLASS[®]

Contact-Less Acoustic Sensing System



Uniquely Intelligent, Multi-Functional and Reliable,
the CLASS Ultrasonic Detection System Increases
Passenger Protection and Optimizes Door Operation

Vapor CLASS®

Contact-Less Acoustic Sensing System

Solid State Ultrasonic Technology Improves Passenger Detection, Reduces Maintenance and Enhances Door System Functionality

The Advantages of Intelligent, Ultrasonic Door Actuation

Exclusive Vapor CLASS technology provides you with a bus door actuation and passenger detection system that is uniquely intelligent and completely reliable. Here are the advantages for your vehicles:

- **Reduces Maintenance Expenses** – solid-state CLASS sensors replace mat switches, push buttons, tapes switches, touch bars and light beams
- **Reduces Dwell Time** – CLASS allows the doors to react directly to the stream of passengers thereby eliminating excessive time delays
- **Robust Components** – designed to resist dirt, humidity, temperature extremes and vandalism
- **Minimizes Passenger Contact** – safe, inaudible and invisible ultrasonic sensor system minimize passenger contact with the doors
- **Advanced Detection Sensors** – enhance function of sensitive edges
- **Reliable Performance** – solid-state signal processing limits false activations
- **Diverse Applications** – for new vehicles and retrofit installations



A Multi-Function Exit Door Solution

The Vapor CLASS system consists of three ultrasonic sensors and a signal-processing module. When activated, CLASS sensors emit bursts of ultrasonic pulses that survey specific spaces within the doorway. The signal-processing module instantly analyzes the echoes received by the sensors to determine whether or not an object (person, parcel or obstruction) is present. When an object is detected, the signal processing module signals the door controls and initiates the appropriate door function.

The CLASS system can be programmed to provide different functions during each phase of the bus door operation.

- **Touch to Open** – the CLASS system functions as a touch bar or touch tape for passenger actuation when a door is enabled but still closed
- **Hold Open** – functioning like a treadle mat, the CLASS system detects a stream of exiting passengers and holds the door open, reducing dwell time
- **Contact-Less Sensing** – panel sensors enhance the function of sensitive edges. As the doors close, the CLASS system enables passengers to exit without contacting the doors
- **Proximity Sensing** – while the bus is in motion, the CLASS system detects passengers standing too



close to, or leaning against, the exit doors and activates a warning light, an alarm or a voice announcement system

CLASS® Detection Zone and Actuation Operation

Here is an example of Vapor CLASS detection zones and actuation operation on a bus exit door. Other CLASS zone configurations may be used to optimize performance with specific vehicles and/or operating practices.

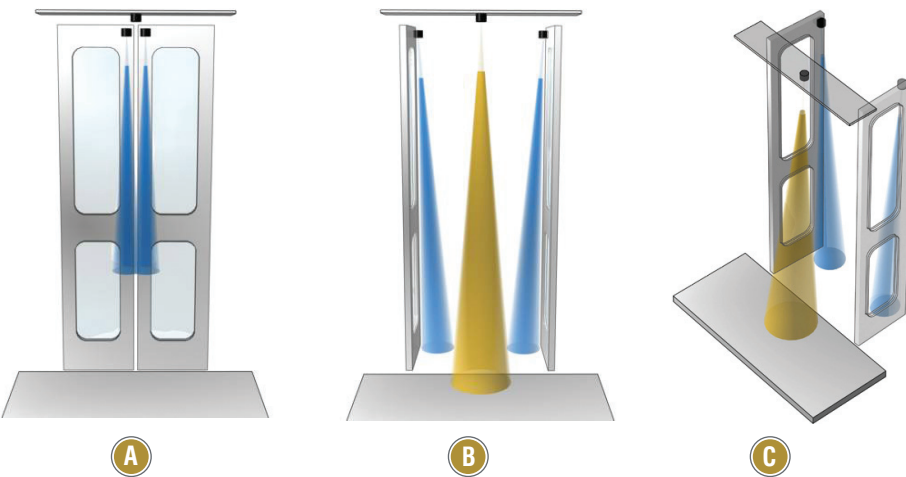
Illustration A: the bus has stopped and the driver has enabled the exit door. In response to the door enable signal, the CLASS signal-processing module has activated the two door-mounted sensors, which monitor two detection zones. These zones function similar to a touch bar or touch tape and extend, approximately, from 12" (30 cm) below the door header to 43" (110 cm) below the door header. When an exiting passenger places their hand within either detection zone, CLASS sensors detect that action and signal the door to open.

Illustrations B and C: when a position sensor on the door actuator indicates the doors are fully open, the signal-processing module automatically changes the detection zone configuration. The door-mounted sensor zones extend almost to floor level and the header-mounted center sensor is activated. In this mode, the CLASS system is now monitoring the entire exit door area. The center sensor maintains the door in the open position for an exiting passenger stream, while the door-mounted sensors enhance the function of the sensitive edge seals

with an expanded detection zone. This mode is maintained until the doors begin to close.

As the doors begin to close, the lower end of the center sensor zone is raised to exclude the area immediately above the floor.

When the doors are nearly closed, and the door remains enabled, the detection zone returns as shown in illustration A.



The CLASS Difference

Programmable Detection Zones

Unlike passenger detection systems based on infrared or visible light, the CLASS system can monitor different spaces during various phases of the door operating cycle. This is a significant advantage that also facilitates the detection regardless of light levels, ambient temperature, moisture and humidity.

Ideal for Low and High Floor Applications

The Vapor CLASS system is applicable for both low and high floor transit vehicles and to all common door geometries. The CLASS system can be installed on new vehicles during manufacture and retrofitted on many existing vehicles. Consult with your Vapor representative to review your applications and determine the appropriate configuration and functionality.

Digital Voice Messaging

The optional CLASS Voice Annunciator provides brief, digitally recorded audio messages, such as warnings, greetings or service announcements, for passengers in the exit door area. Activated in response to inputs from the CLASS controller, a set of standard messages in English and Spanish are available and may be expanded to include additional messages and languages.

This compact and rugged unit is easily installed in the door header space, or adjacent to the doorway, and is applicable to both new vehicles and as a retrofit to existing CLASS III systems.



Consult with your Vapor representative, or Bulletin No. 53-3098, for more information.

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Specifications

Design Life

- 12 Years

Power Supply

- Operating Voltage: 12VDC or 24VDC nominal
- Minimum Operating Voltage: 10VDC
- Maximum Operating Voltage: 37VDC
- Maximum Surge Voltage (1 sec. max. duration): 40VDC
- Transient Voltage Spikes (1 msec. max. duration): +/- 250VDC
- Total System Power Consumption: 30W max.

Inputs

- Working voltage range is the same as the main power voltage specification. Inputs shall guarantee detection as ON when voltage is above 4V and guarantee detection as OFF when below 0.5V.

Outputs

- Dry contacts capable of driving 200mA inductive load
- Solid-state outputs capable of sinking or sourcing 500mA

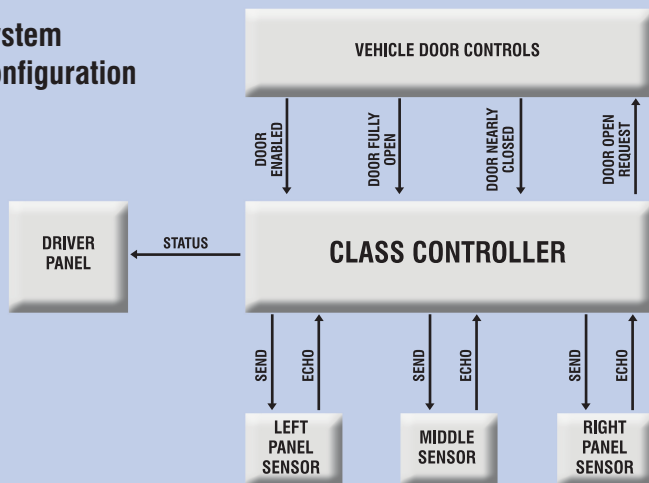
Sensors

- Power: +12 volts from internal power supply
- Analog Output: AC coupled 0-5 volts peak
- Operating Frequency: 120 kHz to 170 kHz

Temperature Range

- -20° C to +60° C

System Configuration



Vapor Bus International World-Class Solutions

As the principal door equipment supplier to the North American bus industry, Vapor Bus International provides superior access solutions, service and product support founded on our unsurpassed industry experience and total concept-to-delivery quality processes. The Vapor commitment drives the intelligent design, manufacture and distribution of a wide range of world-class products for transit and commuter buses, intercity and tour coaches, and utility vehicles. Applications include complete automatic door systems, individual components such as pneumatic and electric actuators, door controls, door panels, seals, and door accessories. Control options range from simple electro-mechanical devices to high-capability, microprocessor-based systems.

For more information on the CLASS system, and other Vapor products, contact your Vapor representative.

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