BUS DOOR SYSTEMS

Vapor Bus International
A Wabtec company

Vapor Profile

Founded in 1903 as a supplier of steam heating equipment for railroad passenger cars, Vapor Bus International has evolved to a leader in the design and manufacture of passenger door systems and other products for buses, rail passenger cars and locomotives. As a division of the Wabtec Corporation, Vapor is a part of a financially sound organization that is totally committed to the transportation industry.

Vapor's approach to product design is based upon a thorough understanding of the physical environment and the operating needs of its customers. Experienced engineers employ advanced design tools and thorough testing to assure reliable products having long life and low life cycle costs in the demanding bus environment.

Ongoing development and improvement programs enhance product performance and value. Specific Vapor door systems are integrated on a custom basis to suit the requirements of both the vehicle OEM and the end user.

Vapor's offices and manufacturing facilities are located in Buffalo Grove, Illinois. Continuous investments in equipment, employee training, and process improvement enable Vapor to satisfy the evolving needs of the global transportation industry.

Supply Scope

Vapor offers a complete line of door systems for buses including actuators, controls, door panels, seals and accessory items. Vapor can engineer a complete system, or provide specific components for integration by the bus manufacturer.

The selection of a door system for a bus depends upon the type of vehicle and upon its total operating environment. Vapor is experienced in the entire range of buses including urban transit buses,commuter buses, intercity and tour coaches and commercial vehicles. Vapor can provide the optimum door system for any vehicle. Through our sister company, Ricon Corporation, we can offer compatible access ramps and lifts as well as window systems.

Transit Bus

Intercity/Tour Coach

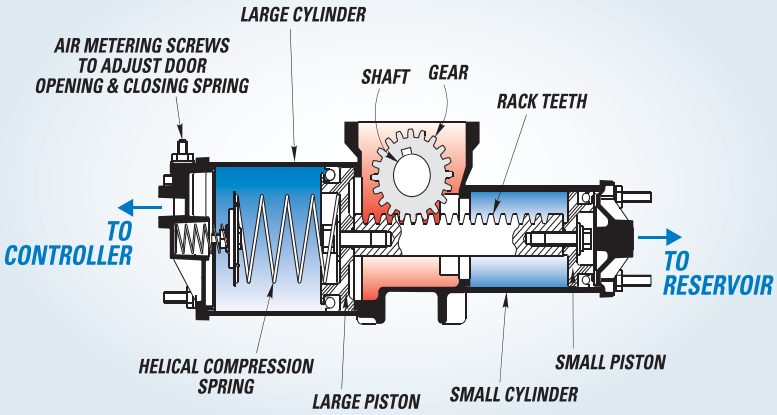
Commercial Vehicle

Pneumatic Differential Engine

Simplicity, reliability and suitability for the task–these fundamentals of application engineering excellence concisely describe the Vapor Pneumatic Differential Engine.

The compact differential engine consists of two opposed cylinders of different diameters with pistons connected by a rack. The rack meshes with a gear converting the straight line motion of the pistons into the rotary motion required for operation of the door linkage.

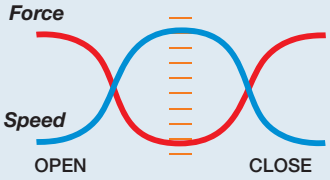
Air pressure is maintained in the smaller cylinder at all times, permitting the use of a 3-way rather than the conventional 4-way valve. Operation is controlled by applying air to, or venting air from, the larger cylinder.



When air is exhausted from the large cylinder, the doors open; admitting air to the large cylinder reverses the direction of the rack and gear causing the doors to close. Toward the end of either the opening or closing stroke, the driven piston encounters an opposing pressure buildup which slows the piston and cushions the opening or closing the door.

Air metering screws permit adjustment of the opening or closing speed of the doors as well as the opening cushioning effect. The differential engine provides effective door operation at air supply pressures between 90 and 120 psi.

Force versus Speed Curves



Vapor's transit-tested pneumatic differential engine provides maximum velocity and minimum force in the mid-point of its range of motion, and maximum force and minimum speed at the extremes of its motion.

Activair® Differential Engine

The Vapor Activair Differential Engine incorporates innovative features for improved performance, easier, less costly maintenance, greater reliability and enhanced passenger security.

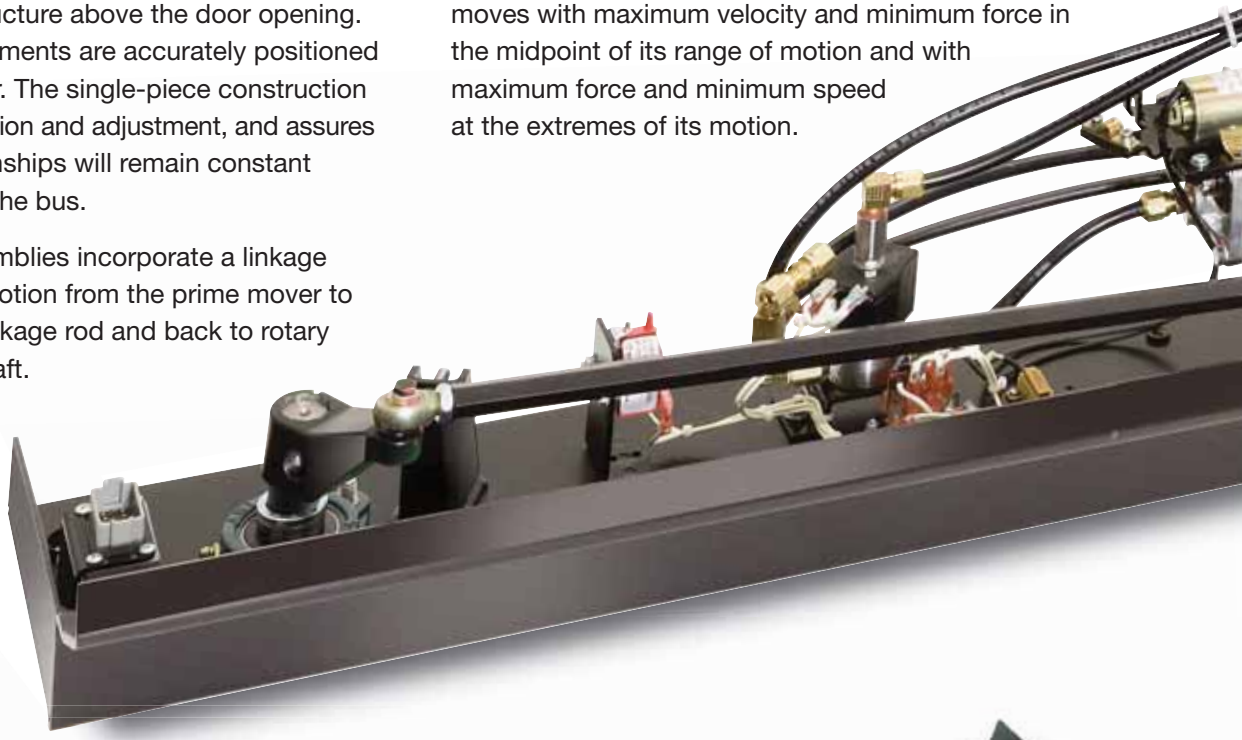
- Finger screws for door speed adjustments – no tools needed
- Adjustable cushioning onset for precise door open speed adjustment
- Solid-state, non-contact proximity switches
- Single engine for all door configurations reduces parts inventory
- Optional locking mechanism secures engine, even if air pressure is lost

Baseplate Assemblies

Most Vapor bus door actuators are delivered as baseplate assemblies. The baseplate combines the prime mover, linkage, and door suspension into a single pre-assembled and tested unit that mounts directly to the bus structure above the door opening. The key geometric elements are accurately positioned relative to one another. The single-piece construction simplifies door installation and adjustment, and assures that geometric relationships will remain constant throughout the life of the bus.

Vapor baseplate assemblies incorporate a linkage that converts rotary motion from the prime mover to linear motion of the linkage rod and back to rotary motion of the door shaft.

By proper arrangement of the relative positions of the output plate on the prime mover, and the door shaft lever on the door shaft, the speed of the door and the actuating force can be optimized so that the door moves with maximum velocity and minimum force in the midpoint of its range of motion and with maximum force and minimum speed at the extremes of its motion.



Air Assisted Open – Spring Close Actuator

This is the most popular configuration for operating exit swing doors on transit buses. The driver unlocks the doors electrically which allows air to be fed into the check cylinder and the doors to open automatically in response to a passenger activating a touch bar or other switch. Once the passengers have alighted, air in the check cylinder is dicharged through adjustable ports, allowing the spring to close the door with a cushioning effect for “soft closing”.

Push Open – Spring Close Actuator

This alternate configuration for swing type exit doors gives passengers complete control of door operation and the highest level of safety. The bus driver controls the door locking mechanism, enabling passengers to push the doors open and step out. The doors automatically close through spring action working against the check cylinder, thereby providing a cushioned cycle. Once closed, a pawl is engaged for positive mechanical locking.

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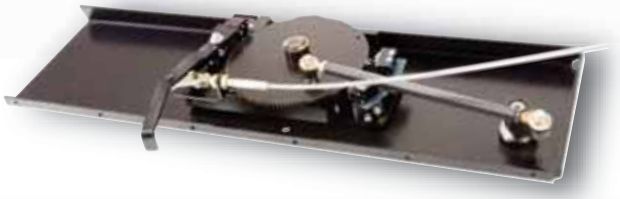
Plug Door Actuators

Vapor Locking Electric Plug Door Actuator



Vapor's premier plug door actuator combines the reliability and simplicity of electric operation with the security of an electrically-actuated positive locking mechanism. Designed and tested for demanding applications, the Locking Electric Actuator delivers maximum performance while requiring minimal maintenance.

Vapor Pneumatic Rotary Actuator

The Vapor pneumatic rotary actuator employs a unique helical cam motion converter to provide high holding torque and positive sealing in the door closed position. As the door moves in only one plane, the need for door alignment adjustments is greatly reduced.

Vapor Electric Lift-to-Latch Actuator

The lift-to-latch actuator uses wedges mounted to the door frame and door jamb with a lifting motion of the closed door panel to retain the door in the closed position. The Vapor electric Lift-to-Latch actuator combines this feature with electric operation and a compact package.

Vapor Pneumatic Lift-to-Latch Actuator

This Vapor pneumatic actuator provides the Lift-to-Latch function with pneumatic operation.

Door Panels

Vapor door panels are fabricated from aluminum alloys to provide strength, light weight and corrosion resistance. Available finishes include paint, anodized, paintable E-Coat and custom finishes. Optional accessories include: vTouch™ Electronic Touch Bar, Universal Passenger Assist, and brushes and seals. All door panels are compatible with the CLASS® Sensing System. All panels satisfy industry standard deflection requirements and applicable FMVSS standards.

Classic™

The standard Vapor door panel has a single exterior skin. Options include interior skins, kick plates and the provision of fully assembled doors with windows installed and all brackets and mounting fasteners attached prior to shipment.

Ameriview®

The Vapor Ameriview door panel combines contemporay appearance with up to 25% glass area.

The unique glazing system requires no fasteners and enables quick glazing replacement.

The Ameriview panel is available in multiple glazing configurations

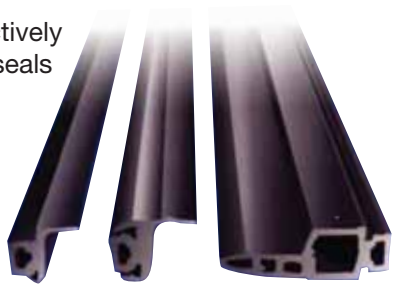
CityView™

Vapor's fully-glazed door panel provides the sleek visual impact desired by appearance-conscious transit agencies.

Aluminum frame construction meets all industry requirements, while the quick change glazing uses no fasteners and needs just minutes for glazing replacement.

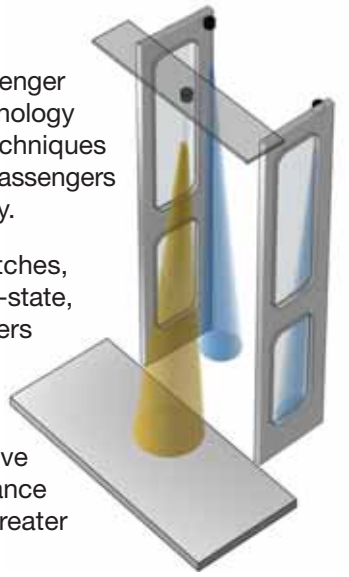
Optional Glass Guard™ sacrificial inner liner is available.

Door Edges and Seals



Vapor door edges and seals are designed to weatherproof the bus simply and effectively and are configured for compatability with the door design and geometry. Elastomer seals are extruded from a neoprene compound and incorporate a "box" or "T" section for mounting into the door panel or door jamb. Articulating door bottom seals including the Vapor ActiveBrush™ are available for slide-glide (inswinging) doors operating over sloped entry floors. All seals, whether elastomer or brushes, meet applicable flammability, smoke and toxic emissions standards.The Vapor air wave "Sensitive Edge" seals between door panels, offering maximum passenger protection with high reliability and minimum maintenance. It incorporates a sealed cavity connected to a highly sensitive pressure wave switch actuated by any change in air volume within the cavity. An object caught between the doors will depress the rubber edge, creating a pulse of air that will activate the switch and reopen the doors or sound an alarm. Other sensitive edge technologies can be provided upon request.

CLASS®
Contact-Less Acoustic Sensing System



CLASS, the next generation in passenger protection, combines acoustic technology with advanced signal processing techniques to provide contact-less sensing of passengers and their belongings in the doorway.

CLASS replaces tape and mat switches, touch bars and push buttons. Solid-state, ultrasonic sensors enable passengers to initiate door opening, provide a “hold open” request for a stream of existing passengers, and enhance the function of sensitive edges. ***The results:*** lower maintenance costs, decreased dwell time, and greater rider satisfaction.

Door Annunciator

The Door Annunciator can provide short audio messages in the exit door area. Digitally recorded messages are delivered in response to inputs from the CLASS controller or other compatible inputs. The messages may be warnings, greetings or service announcements.

This compact, rugged unit is easily installed in the door header space or mounted adjacent to the doorway.

Door Accessories

vTouch® Electronic Touch Bar

The Vapor vTouch features solid-state circuitry that eliminates switch failures and permits vertical or diagonal mounting.

The low profile design reduces intrusion into the door opening, while the universal housings simplify installation and electrical connections.

The vTouch is ADA compliant, meets industry strength standards, and satisfies the NHTSA Drop and Drag Test. The bar element is available in powder coated silver gray or high-visibility safety yellow. vTouch direct replacements are available for conventional touch bars.

Universal Passenger Assist

The Vapor Universal Passenger Assist is worthy of the modern bus. Sleek contours compliment the vehicle’s appearance. Low profile design minimizes intrusion into the clear opening, while the two point mounting maximizes flexibility in positioning the assist.

The Universal Passenger Assist is ADA compliant, meets industry strength standards and satisfies the NHTSA Drop and Drag Test. Standard bar element finishes are powder coated safety yellow and stainless steel. Other colors can be provided as options.

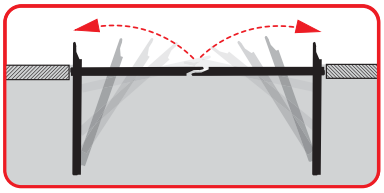
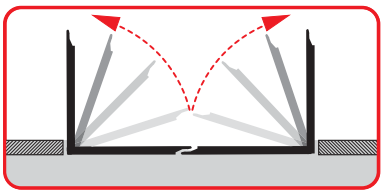
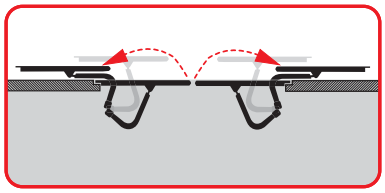
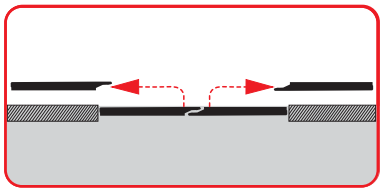
Door System Controls

Controls for Vapor bus door systems can be configured to meet the needs of the vehicle manufacturer. The simplest configuration employs a direct connection between a pneumatic actuator and a pneumatic driver’s door controller. Common configurations interface with the vehicle PLC system to accomodate passenger actuation devices and/or sensitive edges.The microcontroller-based Vapor Control Module is available for complex door systems that require interface with multiple sensors and vehicle systems.

Driver’s Door Controller

Designed to be mounted on the driver’s side console, Vapor driver’s door controllers are available in pneumatic, electric and combination configurations. The basic design has the industry-standard five positions, while optional stops permit setting the number of positions 2, 3, or 4. Controller handles can be provided in several sizes. Most utilize a 5/16 inch square shank that can be used as a key for industry-standard cover latches.

Door Geometries

	Geometry	Attributes	Common Applications
	**Slide Glide**	• Smooth, rapid operation • Limited protrusion outside of vehicle • Door panels may be flat or moderately contoured • Clear passenger path • May require step cutouts	• Transit bus entrance and exit doors
	**Swing**	• Simple geometry • May be spring-closed • Wide doors may protrude outside vehicle • Simple operation in emergency situations	• Transit bus exit doors • Commercial buses and shuttles.
	**Parallelogram Plug**	• Panels can be flat or contoured • Can be made flush with vehicle sidewall • More complex mechanism and adjustments • Requires clear path to front and rear sides of door of opening • Overlaps door opening when open	• Transit bus entrance and exit doors • Intercity and tour coach doors (frequently single panel)
	**Outside Sliding Plug**	• Panels can be flat or contoured • Can be made flush with vehicle sidewall • More complex mechanism and adjustments • Requires clear path to front and rear sides of door of opening • Overlaps door opening when open • May be single panel or bi-parting	• Transit bus mid and rear doors • Single panel may be used in front door if adequate clearance is available aft of opening

Service and Support

Vapor sales and service representatives can assist in maintaining Vapor door systems throughout the life of the vehicle with maintenance training and suggestions for overhaul and upgrade programs.

Genuine Vapor parts, as well as rebuild and upgrade parts kits are available from our authorized distributors and directly from Vapor. Overhaul of Vapor components to factory standards can be provide upon request.

Further information, including brochures for specific Vapor products, is available on our website, www.vapordoors.com, from your Vapor sales and service representative or from our Customer Service Department.

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