



TECHNICAL GUIDE

Tractor Protection Valve: How It Works, How to Test It, Failure Signs

What a truck's tractor protection valve does in a breakaway or low air, how it works with the red trailer supply knob, how to test it and spot failure signs.

A tractor that loses its trailer on the highway, a supply hose chafed through on the fifth wheel plate, or a driver bobtailing to the yard with the glad hands hanging free: in each case the tractor protection valve decides whether the tractor keeps enough air to stop. It is one of the least visible valves on a North American truck and a standard item in the combination-vehicle air brake check on the CDL skills test. This guide explains what it does, how it differs from a pressure protection valve and how to check it.

This guide was prepared by the VADEN technical team from field experience with heavy commercial vehicle air brake systems and OE manufacturer documentation. The pressures, test steps and behaviors described here are general references, including figures quoted from US driver-licensing manuals; for exact closing pressures, port layouts and test limits, the current OE service manual matching the vehicle's chassis and engine code is what governs. Last updated: October 2026.

What Is a Tractor Protection Valve?

A tractor protection valve is an air-operated shut-off valve on a truck tractor that connects the tractor's air brake system to the trailer supply and service lines and closes both lines when trailer supply pressure is lost, so a breakaway, a ruptured hose or a bobtail brake application cannot drain the tractor's own reservoirs.

The tractor protection valve is a North American term. The valve is usually mounted on the back of the cab or on the frame rail, just ahead of where the trailer hoses leave the tractor, and sits between the tractor's brake air and the two trailer lines: the supply line, also called the emergency line, with a red glad hand, and the service line, also called the control line, with a blue glad hand. As long as the supply line is pressurized, the valve stays open and passes service brake signals to the trailer. When supply pressure falls away, it closes and isolates the tractor.

The tractor protection valve exists because the air that stops the tractor and the air that feeds the trailer come from the same compressor and reservoirs. Without a shut-off point at the back of the cab, a severed trailer hose would act like an open tap on the tractor's brake air. Where the valve sits in the wider valve layout is covered in our [overview of truck air brake valves](#).

Inside the tractor protection valve, a piston, a spring and an inlet/exhaust valve open the service path while supply pressure is present and seal it when that pressure is gone; on many designs an exhaust port also vents the trailer service line on brake release.

How Does a Tractor Protection Valve Work With the Trailer Supply Valve?

The tractor protection valve is controlled by the trailer supply valve on the dashboard, the red, usually eight-sided push-pull knob. It usually sits next to the yellow, diamond-shaped parking brake knob; the exact layout varies by chassis.

When the driver pushes the red knob in, tractor reservoir air flows into the trailer supply line. That pressure charges the trailer's reservoirs, releases the trailer spring brakes and holds the tractor protection valve open, so every foot brake application reaches the trailer service line. When the

driver pulls the red knob out, the supply line is exhausted, the trailer's emergency or spring brakes apply and the tractor protection valve seals both trailer lines at the tractor. The supply valve is the switch and the tractor protection valve is the gate, so many complaints, such as a knob that will not stay in, start in the supply valve or the trailer, not in the valve body.

Tractor protection valve state by trailer supply knob position (general reference)

Situation	Red trailer supply knob	Tractor protection valve	Trailer brakes
Coupled, normal driving	Pushed in	Open; service signals pass to the trailer	Released; apply with the foot valve
Coupled, parked or trailer test	Pulled out	Closed	Emergency or spring brakes applied
Bobtailing (no trailer)	Pulled out	Closed; no air leaves the glad hands	Not applicable
Tractor pressure falling into the low range	Pops out automatically	Closes	Emergency brakes apply
Trailer breakaway or supply line rupture	Pops out as supply pressure is lost	Closes	Trailer emergency brakes apply automatically

What Happens to the Tractor Protection Valve in a Breakaway or Low Air Pressure?

The tractor protection valve is built for the two worst cases an air-braked combination can meet: the trailer separating from the tractor, and a leak large enough to pull tractor pressure down. In a breakaway, both trailer hoses tear apart and the supply line dumps to atmosphere. The trailer's emergency relay or spring brake valve sees the loss of supply pressure and applies the trailer brakes with the air or spring force stored on the trailer. On the tractor, the trailer supply valve pops out and the tractor protection valve closes, so the reservoirs stop feeding the broken lines.

With low air pressure the sequence starts on the tractor. If a leak, a compressor fault or a long series of brake applications pulls reservoir pressure down, the trailer supply valve pops out automatically once pressure falls into a low range. US commercial driver's license manuals generally quote that range as 20 to 45 psi; the exact figure is set by the valve manufacturer. The tractor protection valve then closes and the trailer goes into emergency braking.

A service line failure is less obvious. If the blue hose is cut, service air escapes on every brake application and the trailer gets little or no service braking until falling pressure pops the knob. A service line leak is therefore a serious defect, not something to drive on.

Never hold, tape or wedge the red trailer supply knob in, and never bypass a tractor protection valve with a straight connector to keep a trailer moving. Doing so removes the automatic closing that protects the tractor's brake air in a breakaway or a major leak. If the knob will not stay in, find the leak or the faulty valve before the combination is driven.

Tractor Protection Valve vs. Pressure Protection Valve: What Is the Difference?

The tractor protection valve and the pressure protection valve are often confused because both guard the brake air supply, but they do different jobs. The tractor protection valve isolates the tractor from the trailer lines and is controlled by trailer supply pressure. A pressure protection valve is a normally closed valve that stays shut until the air on its supply side reaches its opening pressure; it protects a reservoir or keeps a non-brake circuit, such as air suspension, an air horn or an air seat, from draining the brake reservoirs if that circuit leaks.

The European equivalent of several pressure protection valves in one housing is the multi-circuit or four-circuit protection valve, which splits the air supply into separate brake and accessory circuits and keeps healthy circuits charged if one fails. It is explained in our [four-circuit protection valve guide](#), and the product families are listed under [multi-circuit protection valves](#) and [4-circuit protection valves](#). These are related protection valves, not tractor protection valve replacements.

Protection and trailer valves compared (general reference; functions vary by system and manufacturer)

Valve	What it protects	What controls it	Typical location
Tractor protection valve	Tractor brake air against loss through the trailer lines	Trailer supply line pressure (red knob)	Back of cab or frame, near the glad hands
Pressure protection valve	A reservoir or accessory circuit, opening only above a set pressure	Pressure on its own supply side	In the line feeding the protected circuit
Multi-circuit / four-circuit protection valve	Each brake and accessory circuit against failure of another	Supply pressure from the air dryer	Downstream of the air dryer
Trailer control valve (European)	Trailer braking signal plus breakaway and line-failure reactions	Tractor service and parking brake circuits	Tractor frame, feeding the red and yellow couplings

What Are the Symptoms of a Bad Tractor Protection Valve?

A bad tractor protection valve usually shows up as air leaks at the back of the cab, trailer brake behavior that does not match the pedal, or a red knob that behaves oddly. The same symptoms can come from the supply valve, a glad hand seal, a hose or the trailer, so trace each one first. A wider symptom-to-cause approach is set out in our [air brake fault diagnosis guide](#).

Tractor protection valve symptoms, possible causes and checks (general reference)

Symptom	Possible cause	Check
Air blows out of the blue glad hand when bobtailing and braking	Valve not closing the service path; worn inlet seat or sticking piston	Red knob out, uncoupled, apply the foot brake and listen at both glad hands

Symptom	Possible cause	Check
Red trailer supply knob will not stay in	Low tractor pressure, leak in the supply line or trailer, faulty supply valve	Watch the gauges, soap-test the line and couplings, retest with the trailer disconnected
Red knob does not pop out when pressure is drained	Faulty trailer supply valve; protection function not triggered	Repeat the pop-out test; repair before driving
Trailer service brakes slow or weak	Restriction or contamination in the valve, kinked service hose	Gauge the service line at the glad hand during an application
Trailer brakes slow to release or dragging	Blocked exhaust port, sticking piston, ice in the valve or lines	Check the exhaust port; look for moisture and oil in the tanks
Continuous hiss with the trailer charged	Damaged seals or diaphragm, cracked housing, loose fittings	Soap-bubble test on the body, fittings and exhaust port

Moisture and oil carried over from the compressor are a frequent root cause of a sticking or slow tractor protection valve. If the drained tanks show water or oily sludge, fix the air dryer and compressor first, or a new valve will fail the same way. Cold-weather precautions are covered in [Winter Air Brake Care: Freeze-Up and Moisture Guide](#).

How Do You Test a Tractor Protection Valve?

The tractor protection valve is tested in the air brake check US commercial drivers perform before a trip and demonstrate in the CDL skills test. The steps below follow the general sequence in state CDL manuals; the vehicle manufacturer's procedure and pressure range take precedence. Chock the wheels first.

- 1 Couple and charge:** connect the glad hands and electrical line, start the engine and build pressure to governor cut-out.
- 2 Charge the trailer:** push the red knob in and confirm the trailer spring brakes release.
- 3 Shut the engine off:** leave the key on so gauges and warnings still work.
- 4 Reduce pressure:** fan the brake pedal, applying and releasing it repeatedly, while watching the gauges.
- 5 Watch the red knob:** it should pop out by itself once pressure falls into the manufacturer's specified range, which US CDL manuals generally give as 20 to 45 psi. The low-pressure warning should come on before that.
- 6 Confirm the trailer brakes applied:** with the knob out, the trailer emergency or spring brakes should hold.
- 7 Check the service side when bobtailing:** uncoupled, red knob out, normal pressure, press the pedal and listen at the blue glad hand. Escaping air means the valve is not sealing.
- 8 Test the trailer emergency brakes:** coupled and charged, pull the red knob out and gently pull against the trailer in low gear; the trailer should hold.

If the knob does not pop out in step 5, the defect is safety-critical and the vehicle should not be dispatched until it is repaired.

How Do European Trucks Handle Tractor Protection?

On European tractors built to UN Regulation No. 13, a separate tractor protection valve is not normally fitted and there is no red trailer supply knob. The same safety functions are integrated into the tractor's trailer control valve (Anhängersteuerventil in German), which feeds the red supply and yellow control couplings. It keeps the supply line charged, relays the service signal, applies the trailer brakes when the parking brake is set, and, if the control line breaks during braking, reduces supply line pressure so the trailer brakes automatically. On EBS tractors these tasks move into an electronic trailer control module with a pneumatic backup.

The European trailer control valve is covered in our [trailer control valve guide](#). VADEN supplies [trailer control valves](#), [trailer control valve repair kits](#) and [EBS trailer control valves](#) for European-style systems; they are a different design from a North American tractor protection valve and should not be treated as a substitute for one. Parking and trailer dash controls are described in our [emergency and park-release valve guide](#).

What Should Be Checked Before Replacing a Tractor Protection Valve?

A tractor protection valve is replaced only after the fault is traced to the valve itself rather than to the supply valve, hoses, glad hand seals or trailer. Record the OE part number on the old valve body and confirm it against the vehicle's chassis number and brake documentation. Valves differ in port layout, mounting and built-in functions, so a similar-looking valve may not behave the same.

During replacement, drain all reservoirs before opening any line, label each line, keep thread sealant out of the air passages and fit the valve in the orientation the service manual shows. Afterwards, soap-test every joint and repeat the full test sequence above.

Which Standards and Sources Cover Tractor Protection Requirements?

Tractor protection is set out in regulation rather than in a single part standard. In the United States, design and performance requirements for air brake systems on new vehicles are in [49 CFR 571.121 \(FMVSS 121\)](#), and in-service brake equipment rules, including the breakaway and emergency braking requirement in section 393.43, sit in [49 CFR Part 393, Subpart C](#). Roadside defect criteria are published in the [CVSA North American Standard Out-of-Service Criteria](#).

Outside the United States, the United Kingdom requires every part of the braking system to be kept in good working order under [regulation 18 of the Road Vehicles \(Construction and Use\) Regulations 1986](#), and European type approval of tractor and trailer braking, including automatic trailer braking on breakaway, follows UN Regulation No. 13.

Main guide: Truck Air Brake Valves Explained: Types, Functions and Failure Symptoms

This document is for information only; in practice the vehicle manufacturer's current service manual and safety instructions apply. Values are general references for common heavy-duty systems; use the relevant OE service document for model-specific figures. © VADEN Otomotiv San. Tic. A.Ş. · vadenoriginal.com