KOTR Valve Operation

How does an Air Suspension work (why is a valve necessary?)

Air suspensions use air springs or air shocks to support all or part of a vehicle's (or other equipment's) weight. These air springs are inflated with compressed air to raise the load. Under varying load, air springs change in height to a considerable degree; as the load increases, the spring lowers, as the load is reduced, the spring raises. If there is any variation in the load applied to the air spring, it will be necessary to include a valve in the air spring circuit to control the height of the vehicle suspension. This valve is typically mounted to the vehicle frame and connects to the suspension lower member with a signal link. As the suspension raises and lowers, the valve 'reads' the height of the suspension and adds air to or removes air from the air springs.

Why a Delay Valve?

The valve/air spring circuit forms a closed-loop control system for suspension height. This closed loop system responds directly to the valve input. When the valve is shifted from 'raise' to 'lower' or vice-versa, each movement adds or removes air from the air springs. If the vehicle is travelling on a rough road or the equipment has a variable load (ex: washing machinery), the valve is constantly shifting, and constantly using air from the supply.

By incorporating a delay mechanism into the valve, the minor excursions of the valve control input will not result in any air usage as these signals will simply be ignored. If the valve control link is moved rapidly from 'raise' to 'lower', the delay will prevent the valve from actuating until the average input is shifted away from the valve center position. Once this occurs, the valve will begin to respond by moving to bring the valve center position in line with the new signal input.

The King of the Road integral delay valve reduces unnecessary valve actuation and can significantly reduce air consumption.

What is Deadband?

The deadband is the portion of the valve operation stroke where both the intake and exhaust valves are closed and the air spring is isolated from the supply. When the valve is at the deadband point the vehicle or equipment is at the regulated height. The width of the deadband affects the accuracy of the regulated height. As the suspension approaches the deadband from one direction, the valve will settle at that end of the deadband. As the suspension approaches the deadband from the other direction, the valve will settle at the other end of the deadband.

If the deadband is made narrower to provide a more accurate regulated height, air consumption will increase because the intake and exhaust valves will open more frequently. Incorporating a delay into the valve allows adjustment of a tighter deadband with lower air consumption. The King of the Road valve incorporates a delay mechanism that can be set during the manufacturing process from zero to over 30 seconds to provide the proper delay time for your application.

KOTR Leveling and Height Control Valve (HCV) Installation

Note: For component identification and valve porting information, please refer to our KOTR Exploded View/Valve Porting page.

Inspection

Before beginning the installation of a new Valve check all air line tubing, fittings, air shocks or springs and other components that are tied into the air system. Inspect for cuts, punctures or other damage that may cause an air leak or not allow the HCV to not function properly. Repair any problems before continuing with installation.

Inspect the HCV Control Link that was previously removed from the HCV. Make sure that the rubber bushings are still flexible; if not, replace the Control Link when installing the HCV. These can become dried and brittle and put undue wear and tear on the HCV and shorten its life.

Preparation

Clean the mounting surface where the HCV will mount. Make sure that dirt and debris are removed from the mounting holes. Thoroughly clean the two air line fittings that will attach to the HCV. Preventing dirt from entering the HCV will ensure a long trouble free life from your new HCV.

Note: If your model uses straight SAE threads check the new HCV to make sure the gaskets are properly installed in the bottom of each air line fitting.

Note: Do not use thread sealant on any of the air line fittings. It is not required for a proper seal and can cause the HCV to malfunction if the sealant enters the HCV or other system components.

KOTR Leveling and Height Control Valve (HCV) Installation

Installation

Attach the HCV in the original mounting location. Tighten the two bolts.

Connect and tighten the two air line fittings to 50-60 in-lb (5.5-6.5 N-M).

Note: Do not loosen the lock nut on the HCV control Arm as it is factory preset. Connect the Control Link to the HCV Control Arm and lightly tighten. Over tightening may cause the HCV to not function properly. Connect the other end of the Control Link to its mounting bracket.

Pressurize the air system to normal operating pressures. Check air line connections using a soap-water solution and watch for bubbles which would indicate an air leak. If bubbles are present gently tighten the air line fitting until the bubbles stop. Do not add any type of sealant to stop leaks.

Height Adjustment

Check the equipment height per the equipment manufacturer's instructions and recommended height specification.

If adjustment is required:

For Fixed Length Control Links

Loosen the Lock Nut on the side of the HCV Control Arm using a 7/16" hex wrench. Move the Overtravel Safety up to increase the height and down to reduce the height. Tighten Lock Nut to 70-80 in-lbs (8-9 N-M) and re-check the height. If it is necessary to make height adjustments greater than that allowed by the adjustment built into the valve overtravel mechanism, it will be necessary to change to a different length link.

For Adjustable Length Control Links

Do not loosen the Lock Nut on the HCV control Arm as it is factory preset. Follow the Control Link manufacturer's instructions to adjust the Control Link, which will then change the height of the vehicle or equipment.

KOTR Height Control Valve Maintenance

Note: For component identification and valve porting information, please refer to our KOTR Exploded View/Valve Porting page.

Maintenance

The King of the Road™ Height Control Valve is a precision-built device, carefully calibrated using dedicated test and inspection equipment. It is not recommended to attempt field service or adjustment beyond the arm/height adjustment or troubleshooting detailed in our other technical documents. In the unlikely event a King of the Road™ Height Control Valve does require service, return it to King of the Road for warranty consideration.

Removing Cover/Mounting Bracket

Removal of mounting bracket (cover) is not recommended because of possible contamination of the valve internal components.

Repair Parts

Please note that fittings, gaskets check valves and other components are available. Please see our 'Contact Us' page for ordering information.

KOTR Valve Troubleshooting

Inspection

It is unusual for a King of the Road valve to have a problem; most complaints can be isolated to other components in the system. Before troubleshooting a height control valve check all air line tubing, fittings, air shocks or springs and other components that are tied into the air system. Inspect for cuts, punctures or other damage that may cause an air leak or not allow the HCV to not function properly. Repair any problems before continuing with troubleshooting.

Problem	Procedure
Valve Leaks Air	**To find a leak in the valve area,** pressurize the system to normal operating pressure, and then spray valve and fittings with soapy water solution to detect leak location. **No leak found** – Do not remove valve, first check balance of system. **Leak at air line to valve** – If fittings are not tight, tighten to 35-40 in/lbs. Do not over-tighten or valve body may deform. Recheck for leaks. If valve still leaks, remove fitting and make sure gasket is in place in the adapter. Replace gasket if damaged or missing. Reinstall fittings and retest for leaks. **If valve leaks**, return for warranty consideration.
Valve Does Not Intake or Exhaust	**If the valve does not intake or exhaust**, disconnect link from valve actuating arm and move arm down briefly, then up approximately 2" (measured at the end of the arm). After a delay of 2-14 seconds air should begin to enter the system. Move arm down 2". After a delay of 2-14 seconds air should begin to exhaust. Note that valves for some applications may have significantly longer delay times (as high as 45 seconds), though this is rare. **If valve does not intake or exhaust**, remove and return for warranty consideration.

KOTR Valve Troubleshooting

Vehicle Rises and Falls
An intake leak will cause the load to rise and fall. If the intake is leaking, the load will rise. When the control arm actuates the valve, the load will fall slightly. This action repeats.

If the vehicle rises and falls continually, disconnect linkage from the end of the valve actuating arm and attempt to move the arm into a neutral or “dead band” position. With the arm within the deadband, no air should pass into or out of the system.

If air cannot be shut off in the deadband, remove the valve and return for warranty consideration.

System Leaks Down When Off
This can be caused by a leak anywhere in the system after the valve or by an exhaust core leak in the valve itself.

To check the valve exhaust core, pump up the system, remove the link from the end of the actuating arm and hold the valve arm in the central ‘deadband’ position. There should be no air escaping from the valve.

If air is escaping from the valve, remove and return for warranty consideration.