

FACEL BRAKE SAFETY

LIABILITY DISCLAIMER

This is provided for informational purposes only, is not a recommendation, and no liability is assumed by the writer or Amicale Facel Vega. Any brake work performed on a vehicle, including installing a safety kit, should only be done by a skilled and knowledgeable professional brake mechanic who can test and certify that the brakes are working correctly before releasing the vehicle. Brake work, including installing a safety kit, is not to be done by an amateur hobbyist.

Dual Circuits Needed For Safety

Vehicles sold new in the United States before 1967 were not required to have a dual circuit brake system. Most pre-1967 vehicles, including all Facel-Vegas, were made with single circuit systems. With a single circuit brake system, if there is a fluid leak from any part of the brake system, the brake pedal can drop to the floor and stopping performance can be completely lost. With a dual circuit brake system, if a leak develops in one component, there should be two wheels that still have brakes. Experiences of single circuit brake failures by myself or friends driving Facel vehicles include: parking brake stuck on during a one hour highway drive, completely melting the rear caliper seals; original Bakelite-plastic brake light switch burst open; rubber flex line to front caliper burst; rebuilt Kelsey-Hayes vacuum booster seal failure, all brake fluid sucked into engine. Also, in a single circuit brake system 1965 Ford, the metal brake line on the rear axle burst while bleeding the brakes after installing a new master cylinder.

The Search for a Dual Circuit Brake Conversion

In order to avoid personal injury and vehicle damage, a strong commitment was made to convert the brakes of HK2B116 and HK1CD5 to dual circuit systems. A search was started for a dual circuit brake conversion that would maximize safety and minimize changes to the appearance and structure (no cutting or welding) of the vehicle. Here are the options considered, with a following comparison of the benefits (+) and weak points (-) of each system:

Manual Non-Boosted Brakes

Dual circuit manual brakes with no booster were carefully thought out and discussed at length with several brake experts. The HK500 with disc brakes and Facel IIs, at about 4,100 lbs, have brakes at the wheels that are under-dimensioned by modern brake standards. For the size and speed capability of the vehicles, the brake pads are about 1/3 the modern size, and the caliper pistons are also smaller than a modern vehicle similar in size. Using a dual circuit 1 3/16" master cylinder, a maximum un-boosted pressure reading of 700 psi was taken at the caliper. Leaving the pad and caliper original sizes alone, pedal pressures to operate a manual brake system would be high and would not be enjoyable to use in driving, so the concept for this system was discarded. In order to be minimally intrusive to the brake system, the decision was made to leave the wheel brakes alone and focus on a boosted dual circuit conversion.

Dual Remote Vacuum Boosters

To have a dual circuit system, a tandem-dual master cylinder or two separate master cylinders and two separate remote boosters can be used. This would be closest to being correct for late 50s and early 60s vehicles, as a Dunlop/Girling system was used on the Aston Martin DB5 and other similar late 60s vehicles. The plumbing of the hydraulic lines is complex, with up to six lines across the frame, and additional effort is needed to bleed the remote boosters and lines. While this system should perform fine, the search continued for a solution with simpler brake plumbing and easier installation.

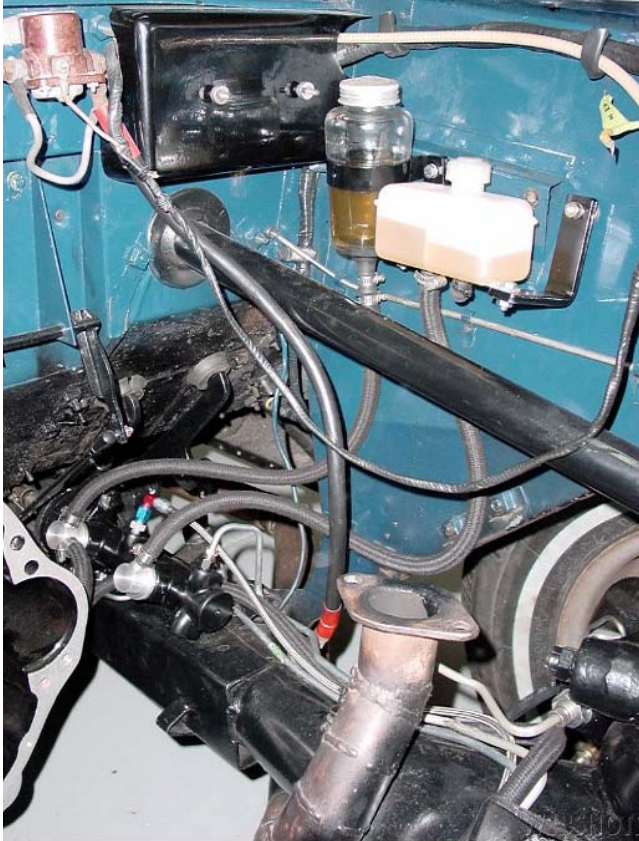
Hydro-boost® Booster

A Bosch Hydro-boost booster dual circuit conversion was installed on HK2B116. The booster was mounted directly on the original brake pedal assembly, a tandem dual circuit master cylinder was mounted on the booster. One brake line came off the master for the front brake circuit and another line came off the master for the rear brake circuit, greatly simplifying the brake plumbing. The power steering high pressure line feeds the brake booster, then the high pressure goes to the steering unit, then the remaining pressure drains back to the pump. Simplification of the brake circuit plumbing resulted in added complexity of the power steering plumbing. While the braking performance was excellent with up to 1800 psi pressure available at the caliper, there was only about 5% braking capability with no pressure available from the booster, such as from an internal leak in the power steering pump. With no boost, the brakes will not hold the car stopped with the engine idling and the transmission in Drive. This system must be avoided!

Electric Booster Solution

Electric brake boosters are quite common on new luxury cars. Lexus, BMW, M-B, and Cadillac use electric boosters, which should last the many years and many miles expected of a modern vehicle. Cesar Rodes discovered this solution and had it installed by professional brake experts on HK500 HK1CD5. For the Facel V8, the electric booster is mounted remotely with an adapter bracket in the same location as the original vacuum booster, and a compatible dual circuit master cylinder was mounted with an adapter bracket in the same location as the original master cylinder. All new steel brake lines connect the master cylinder to the front and rear brakes with separate circuits. One brake line comes off the master for the front brake circuit and another line comes off the master for the rear brake circuit, greatly simplifying brake plumbing and the bleeding procedure. One high pressure steel-braided line connects the booster to the master. There is a pressure sensor brake light switch mounted on the front circuit. The front two rubber flex lines and the one rear rubber flex line were replaced, all four caliper pairs were sleeved and rebuilt, and new caliper metal bridge pipes were installed. The electric booster pump only runs when accumulated boost pressure falls to a predetermined level. Light pedal pressure is needed for normal driving, the pedal stays high and firm, and it is easy to modulate brake application. With the electric booster 12V power source disconnected, brakes can be locked-up with a firm push on the brake pedal. The vehicle was also test driven with a leak in the rear brake circuit and the vehicle could still be stopped.

- The plumbing for the electric booster system involves:
 - (1) high pressure line from the booster to the master
 - (1) pressure line from the master to the front brakes (front circuit)
 - (1) pressure line from the master to the rear brakes (rear circuit)
 - (1) zero pressure line from front master to one reservoir
 - (2) zero pressure lines from booster and rear master to second reservoir
- The electric relay connections for the electric booster involve:
 - (1) 12V connection to the battery side of the starter relay
 - (1) 12V connection to the ON terminal of the ignition switch
 - (1) Ground connection to the frame
- Drum Brakes
The conversion on HK1CD5 should also work for V8 Facels with drum brakes. As with discs, the brakes should be fully rebuilt when installing the conversion kit. This would involve rebuilding all wheel cylinders, correcting drums as needed, installing new front and rear rubber flex lines, and installing all new steel brake lines, including caliper bridge pipes. Unlike disc brakes, a residual valve would need to be used.



Conversion Master Cylinder, Reservoirs, on HK1CD5



**Electric Brake Booster, installed on HK1CD5 in same location as original Vacuum Booster
(It is normally hidden by the original stone shield, which was removed to show mounting detail.)**



Electric Brake Booster Safety Conversion Kit Components
 (Not included: Metal Brake Lines, second Reservoir and Reservoir Bracket)

Booster Systems Comparison

Characteristic	Original	Dual Vacuum	Electric
Dual Safety Circuits	-	+	+
Easy Emergency Stop	-	+	+
Firm Pedal	-	+	+
Good Control, Modulation	-	+	+
Lock-up Wheels with Max Pedal Pressure	-	+	+
Ease of Obtaining Replacement Parts	-	+	+
Vehicle Stops if Booster Output-circuit Fails	-	+	+
Ease of Bleeding Brakes	-	-	+
Simplicity of Plumbing	-	-	+

HK1/FACEL II - Original Single Circuit Major Component Specifications

Master Cylinder: Lockheed-Bendix-France, 22 mm, single circuit,
Booster: Kelsey-Hayes-USA Model 130S, remote vacuum, 800 psi output pressure (This unit was originally used on some early 1950s Chrysler drum brake vehicles.)
Reservoir: Single Lockheed-Bendix-France glass jar remote reservoir
Calipers: Dunlop-UK, 2 1/2" Front (same as Jaguar Mark IX front)
Dunlop-UK 1 3/4" Rear (same as Jaguar XK150 rear)
Discs: Dunlop-UK 12" Front, 11 1/2" Rear
Metal Lines: Copper lines are soft, may crack from vibration/pressure

HK1CD5 – Electric Boost Dual Circuit Conversion Major Component Specifications

Master Cylinder: ABS Power Brake Electric High Power, 1 3/16" dual circuit
Booster: ABS Power Brake Electric High Power , 12V, 1700 psi measured at caliper
Reservoirs: Original reservoir for rear circuit and booster + second reservoir for front circuit
Note: Use 5"Hx2 1/2"W large reservoirs to ensure maximum fluid capacity
Calipers: Sleeved and rebuilt originals, with new steel bridge pipes, rubber flex lines
Discs: Original
Metal Lines: All new steel lines installed

CONCLUSION

The electric boost dual circuit conversion results in a brake system that is affordable to buy, offers straight-forward bolt-on installation of major components for an experienced brake expert, improves brake safety, has reliable modern components, and is enjoyable to use. The brake kit is offered for sale by the US supplier ABS Power Brake, is not a product of the writer, and is not marked-up by the writer. The writer is sharing this information with the hope that this solution will help others to repair and upgrade the safety of their brakes so they can enjoy driving their vehicles. Thanks to Amicale Facel Vega member Cesar Rodes for sharing information and pictures of this brake safety kit installation. For more information or how to order a brake safety kit from the US supplier, contact:

Mark Morgan
Facel Club USA
Amicale Facel Vega member
PO Box 6142
San Pedro CA
90734 USA
markontheweb@cox.net
310-528-7471

Video of the braking performance of HK1CD5: www.facelcars.com/Safety.html

Additional pictures of the installed kit on HK1CD5:
<http://rides.webshots.com/photo/2794077440043161802PHbMna>