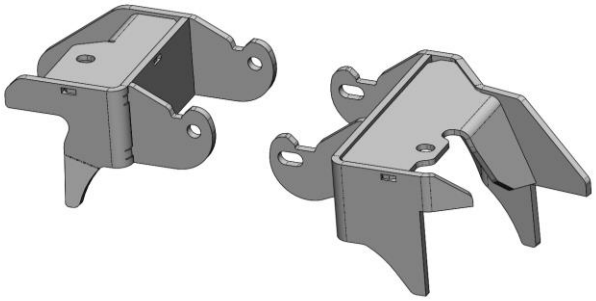
1997-2006 JEEP WRANGLER LS or LT SWAP ENGINE MOUNTING BRACKETS
BHS513



Installation Instructions

Thank you for choosing to use Hooker Blackheart products on your 1997-2006 Jeep Wrangler LS or LT engine swap project. These engine mounting brackets are part of the most comprehensively designed engine swap system available for installing an LS or LT engine into this vehicle application. They have been specifically designed to reduce the time and effort required to carry out this swap in Jeep Wranglers factory equipped with the 4.0L 6 cylinder engine. These brackets are not compatible with the 4 cylinder Jeep Wrangler frame. It is highly recommended that the Hooker Blackheart 1997-2006 Jeep Wrangler LS-LT Engine Swap Technical Guide be read fully before beginning the installation of these components, as the information contained within it will be helpful in understanding the overall scope of the project that will be undertaken by the user.

PRE-INSTALLATION CONSIDERATIONS:

Check that the hardware package includes the following**:**

BHS513 Hardware	
2	M10 x 1.25 bolts

If any listed hardware is missing, please contact Technical Service at: 1-866-464-6553 or 270-781-9741.

IMPORTANT! Position and support your vehicle on a suitable surface. **USE CAUTION AND WORK ONLY ON A LEVEL SURFACE USING JACKS AND JACK STANDS OF SUFFICIENT CAPACITY TO LIFT AND SUPPORT YOUR VEHICLE. NEVER WORK UNDER A VEHICLE SUPPORTED BY A FLOOR OR BUMPER JACK.** Use of a two-post under arm lift or four-post drive-on lift will considerably reduce the time and effort required to complete the installation. **MAKE SURE LIFT LOCKS ARE ENGAGED BEFORE WORKING UNDER THE VEHICLE.**

These engine mounting brackets have been designed and validated to provide installation of a GM 4L60E/4L70E transmission into the vehicle, behind an LS or LT engine without requiring a body lift (in installations using a stock engine inclination angle configuration only), or a suspension lift. Installing the engine in a belly-tuck configuration, using a transmission other than a 4L60E/4L70E, or using a transfer case other than a NP231J, will require a body lift in most instances, and possibly a suspension lift. Close attention should be given to ensure adequate operational clearances are provided between the front suspension passenger side upper control arm and the lower outlet hose of the radiator (if using a down flow radiator).

These brackets may be used as part of an emissions legal swap if factory manifolds and catalytic converters can be found that are compatible with these engine mounting brackets and are permitted for use in this swap application. Existence of such components has not been ascertained. Hooker Blackheart headers and Y-pipes for this this application are designed for racing use only, on vehicles that will not be used, or registered for use on public roads or highways.

Installation should only be carried out by individuals with adequate welding skills and experience. 110V welding equipment is not recommended for use in installing these components.

INSTALLATION:

NOTE: Installation of an LS or LT engine onto these engine mounting brackets will require the use of additional user-supplied parts. The specific parts needed are as follows:

Hooker Blackheart 71221018HKR clamshell (2 required, LS engines only), 71221019HKR clamshell (2 required, LT engines only) 71221016HKR (black) /71221017HKR (red) polyurethane engine mount inserts (2 required) and 71223015HKR engine mount hardware kit (1 required).

Any questions? Please contact Technical Service: 1-866-464-6553 or 270-781-9741. For online help, please refer to: www.holley.com.

1. Disconnect the cables from the battery and remove the battery from the vehicle.
2. Recover the refrigerant from the A/C system, using suitable equipment.
3. Remove the A/C accumulator and refrigerant lines.
4. Remove the A/C accumulator mounting bracket from the firewall.
5. Drain the coolant from the radiator/engine and remove the radiator.
6. Remove the stock wiring harness, including the fuse/relay center.
7. Remove the front and rear drive shafts.
8. If the stock NP231J transfer case is being used in this swap and you are going to try to reuse the existing drive shafts, measure and record the distance between the yoke center of your transfer case rear output shaft and the yoke center of the rear differential pinion. You can retake this measurement after the LS/LT based power train is installed and compare it to this initial measurement to determine if you need to lengthen or shorten your drive shaft to be able to reuse it. If new drive shafts are going to be made for the swap, it is recommended that the driveshaft provider be consulted as to how they would like measurements should be taken.
9. Remove the engine, transmission and transfer case from the vehicle, using the prescribed steps in the Jeep TJ factory service manual.
10. Remove the throttle cable throttle pedal.
11. Clean the engine bay with a pressure washer, or by other suitable means.
12. Remove the front fenders/inner fenders.
13. Mark a fine line (by using the edge of a piece of tape or a scribe) 2-1/4” from the center of the outermost threaded hole that is on top of the stock **DRIVER’s** side engine mount frame bracket. Remove the inward portion of the frame bracket by cutting up to, but not beyond, the marked fine line with a reciprocating saw or cut-off wheel. See images 1 and 2 below for a before-and-after visual representation of this step. **NOTE:** Do not cut or modify the stock steering support frame bracket in any way as it is not required.

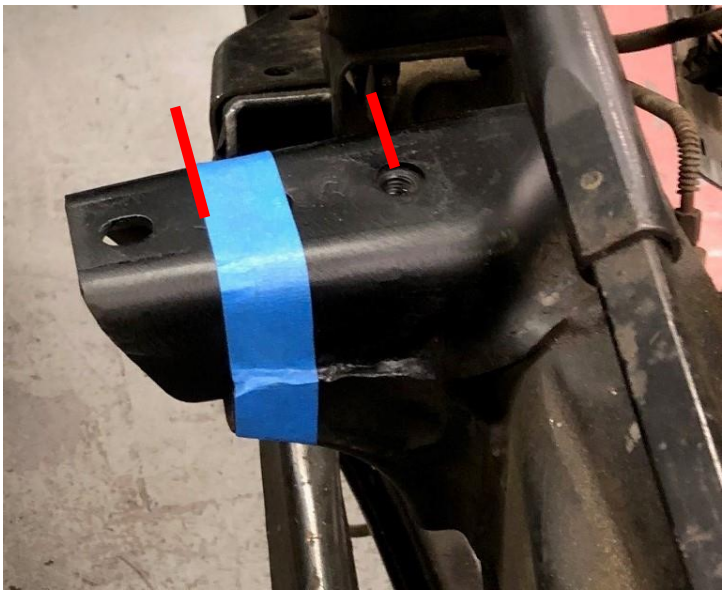


Image 1- Before Trimming

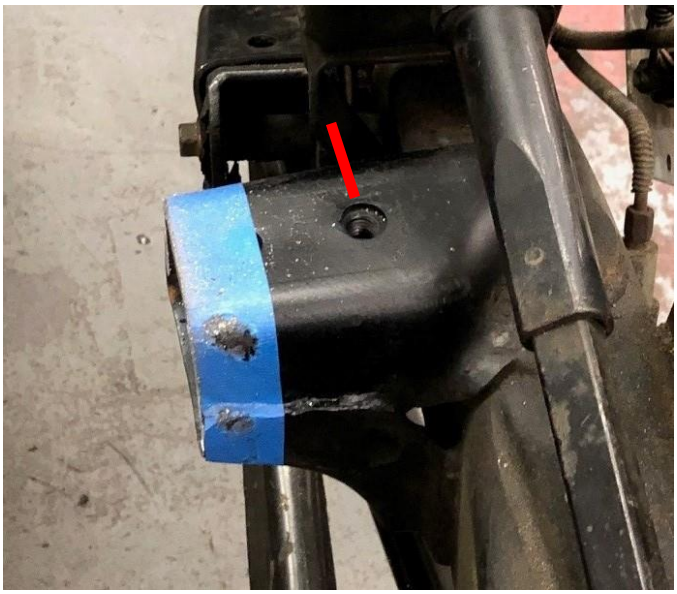


Image 2- After Trimming

14. Mark a similar fine line 1-7/8” from the center of the outermost threaded hole that is on top of the stock **PASSENGER’s** side engine mount frame bracket. Remove the inward portion of the frame bracket by cutting up to, but not beyond, the marked fine line with a reciprocating saw or cut-off wheel.

15. Using a wire wheel and/or sanding disk mounted in an angle die grinder, remove the paint from all around the stock engine mounting brackets at their interface with the frame rails.

16. Thoroughly clean the shipping oil finish from the supplied engine mounting brackets using dish washing detergent or brake cleaning fluid and let them dry.

17. Temporarily attach the supplied brackets to the trimmed factory frame brackets using the supplied bolts. Evaluate the ability of the supplied brackets to sit down flat against the tops of the factory frame brackets without having to draw them down with the bolts to do so. If they do not sit down flat, it indicates that there is interference somewhere between the supplied brackets and the stock frame brackets that will need to be relieved slightly with a grinder or sanding disc. The most likely location for interference to occur is where the factory bracket was trimmed off (i.e. it was cut slightly too long), or where the edges of the end support plates of the supplied brackets rest against the stock frame mounts or frame.

18. Working slowly and carefully with the grinding/sanding tool, relieve any edge(s) of the supplied brackets, or the factory frame brackets/welds, that are needed to allow the supplied brackets to rest on top of the factory brackets and against the frame rails without having to be drawn down with the supplied bolts to do so.

19. Remove the supplied brackets from the frame and apply a coat of weld-through primer to their undersides and let them dry.

20. Once the primer is dry, grind a 45° bevel on the ends of the supplied brackets where they will be touching the inside walls of the frame rails. In order to identify exactly where the grinding needs to take place, Hold the brackets against each frame rail and mark them with a permanent marking pen to indicate where welding beads will be getting placed. Refer to Images 3 and 4 below for reference as to where this pre-weld beveling needs to be performed. The locations indicated with yellow lines will be beveled only on the side of the plates that the lines lie on. The location indicated with the red line should be beveled equally on both sides of the plate as welding access is available on both sides of the plate.

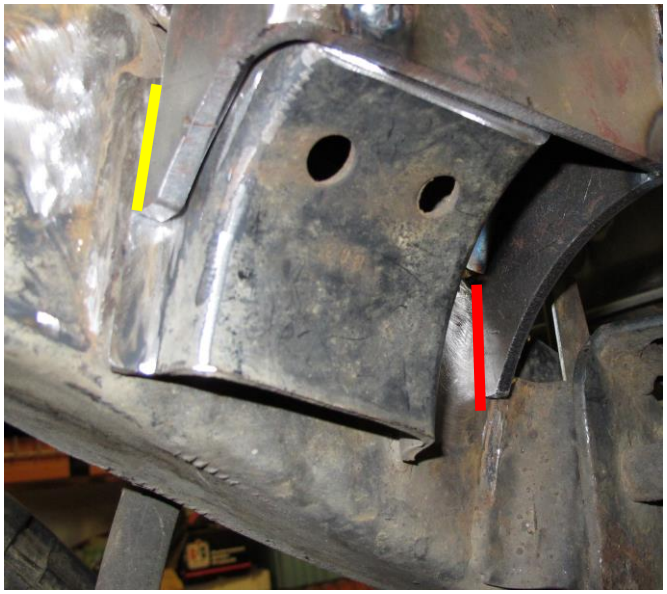


Image 3 - Passenger's Side

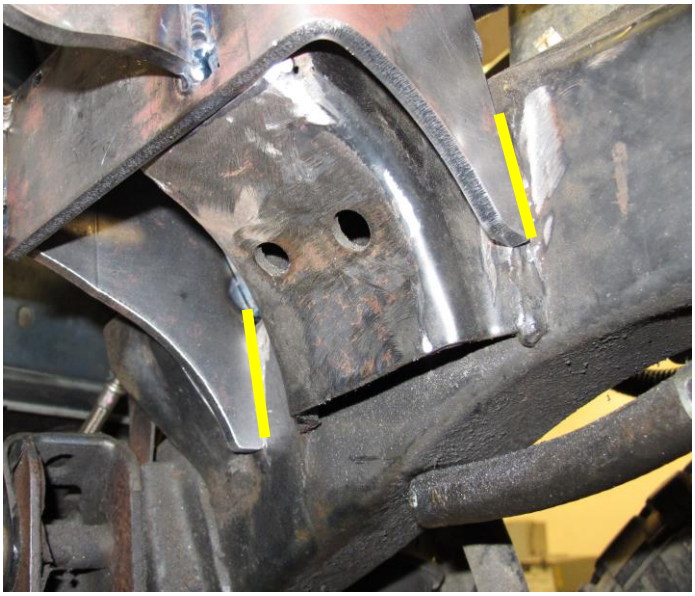


Image 4 - Driver's Side

21. Use a hammer and fold the bottom of the firewall/tunnel pinch weld flange flat against the tunnel along a crease line approximate to that indicated by the red line in Image 5 below.

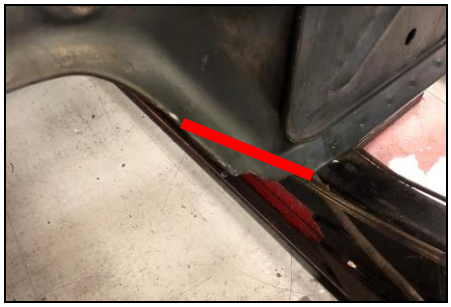


Image 5

22. Re-attach the supplied brackets to the stock frame brackets and push them out against the frame rails, while the bolts are tightened to about 18 ft. lbs.

23. Attach a Hooker Blackheart 71221018HKR (LS) or 71221019HKR (LT) clamshell cage and 71221016HKR (black)/71221017HKR (red) poly insert to both sides of the engine per the instructions included with those products.

24. Using an engine hoist, lift the engine and lower it down into the Hooker Blackheart engine mounting brackets and couple them together using the bolts and nuts from the Hooker Blackheart 71223015HKR hardware kit. The nuts should be installed on the bolts for safety, but do not need to be fully tightened at this time.

25. Support the rear of the engine with a screw jack or other load holding device and remove the engine hoist from the engine.

26. Install the transmission and transfer case adapter to be used in the vehicle (not the transfer case at this time) and attach them to the stock 1997-2002 Jeep Wrangler skid plate, the stock 2003-2006 Jeep Wrangler skid plate, or another crossmember/skid plate following the guidance below. The powertrain inclination angle achieved in all three cases is a reference point that can be modified to suit the needs of a specific build type (i.e. using a transfer case drop for adjusting U-joint working angles, or reducing the engine inclination angle to assemble the vehicle in a belly tuck/double cardan joint equipped driveshaft configuration).

    Installations using Novak transfer case adapters and the stock Jeep Wrangler skid plate:

    Mount/attach the transfer case adapter to the skid plate using the angled mount bracket included with the Novak transfer case adapter, a Hooker Blackheart 71223029HKR or 71223030HKR transmission mount and a 1/4" thick (1997-2002 skid plate), or 1-1/4" thick (2003-2006 skid plate) user-supplied spacer that will be placed between the Hooker Blackheart transmission mount and the skid plate. Two new holes, spaced 1.5" apart on center, will need to be drilled in the stock skid plate to match the hole pattern in the bottom of the Hooker Blackheart transmission mount. Mock-up the mount assembly in the vehicle and mark the needed fore/aft location of the holes on the bottom surface of the skid plate, which will be drilled later when the engine and transmission are removed again for final welding of the engine mounting brackets. It is recommended that the holes be slotted slightly front to back after drilling to provide some tolerance to their fore/aft location.

    To achieve the landing of the transmission mount on the skid plate as intended, the angled transmission mount bracket included with the Novak transfer case adapters will be attached the adapters in an orientation that points the bottom foot of the angled bracket towards to rear of the vehicle on 4L60E, 6L80 and TH400 transmission installations, and towards the front of the vehicle on 4L80E transmission installations. The stock 4L60E, 4L80E 6L80 and TH400 transmission oil pans have all been validated to clear the stock Jeep Wrangler skid plates when the engine/transmission are installed using the method described above.

    Installations using an Advance Adapters/other transfer case adapter and the stock Jeep Wrangler skid plate:

    1997-2002 skid plate- construct a transfer case mount assembly that provides a measured height of 7-1/4" from the center of the transmission output shaft hole to the bottom surface of the transmission mount and that lands the bottom of the mount adjacent to the two forward most slots in the raised rib in the center of the skid plate. Two new holes, spaced 1.5" apart on center, will need to be drilled in the stock skid plate to match the hole pattern in the bottom of the Hooker Blackheart transmission mount. Mock-up the mount assembly in the vehicle and mark the needed fore/aft location of the holes on the bottom surface of the skid plate, which will be drilled later when the engine and transmission are removed again for final welding of the engine mounting brackets. It is recommended that the holes be slotted slightly front to back after drilling to provide some tolerance to their fore/aft location.

    2003-2006 skid plate- construct a transfer case mount assembly that provides a measured height of 8-1/4" from the center of the transmission output shaft hole to the bottom surface of the transmission mount and that lands the bottom of the mount adjacent to the two forward most slots in the middle of the skid plate. Two new holes, spaced 1.5" apart on center, will need to be drilled in the stock skid plate to match the hole pattern in the bottom of the Hooker Blackheart transmission mount. Mock-up the mount assembly in the vehicle and mark the needed fore/aft location of the holes on the bottom surface of the skid plate, which will be drilled later when the engine and transmission are removed again for final welding of the engine mounting brackets. It is recommended that the holes be slotted slightly front to back after drilling to provide some tolerance to their fore/aft location.

    Installations using an aftermarket or custom skid plate or transmission crossmember:

    In order to achieve the same nominal stock engine/transmission inclination angle used on the stock Jeep Wrangler skid plates described above, construct a suitable mount for your transfer case adapter that positions the engine/transmission at a 6.5° down angle in the frame relative to the plane at the bottom of the frame rails. Be sure to use a digital inclination gauge to take this measurement as mechanical protractors are not accurate enough to use for this purpose.

27. Visually inspect the position of the supplied engine mounting brackets a final time to confirm they are still bearing up against the frame rail, If not, slightly loosen their attaching bolts, one at a time, and force the brackets outward against the frame by wedging a pry bar between the engine mount cages and the mounting brackets. Hold each bracket against the frame and tighten the attaching bolt to hold it in place.

28. With the drive train installed at the inclination angle you intend it to be used in, tack weld the engine mounting brackets in place on the frame and then remove the engine, transmission and transfer case from the vehicle once more.

29. Weld the engine mounting brackets to the frame at the locations shown in image 6 below for the passenger side bracket, and images 7 below for the driver side bracket. As prescribed for the beveling in step 20, the weld locations indicated with yellow

lines should be welded only on the side of the plate the lines lie on; the locations indicated with red lines should be welded on both sides of the plates since there is access to do so. You may increase the number of welds beyond this point, or fully weld them, as you so choose.

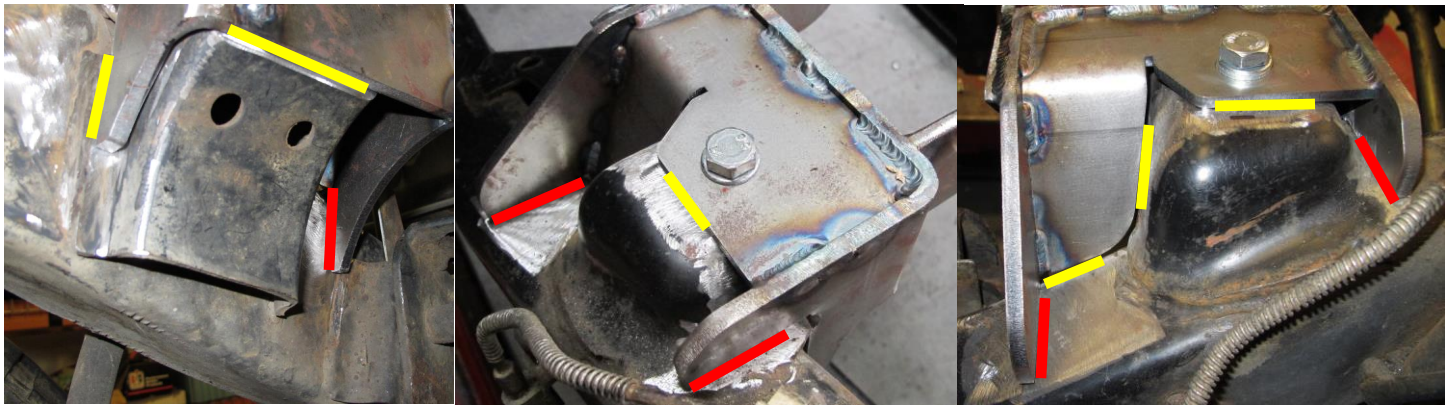


Image 6- minimum weld locations for the passenger's side engine mounting bracket

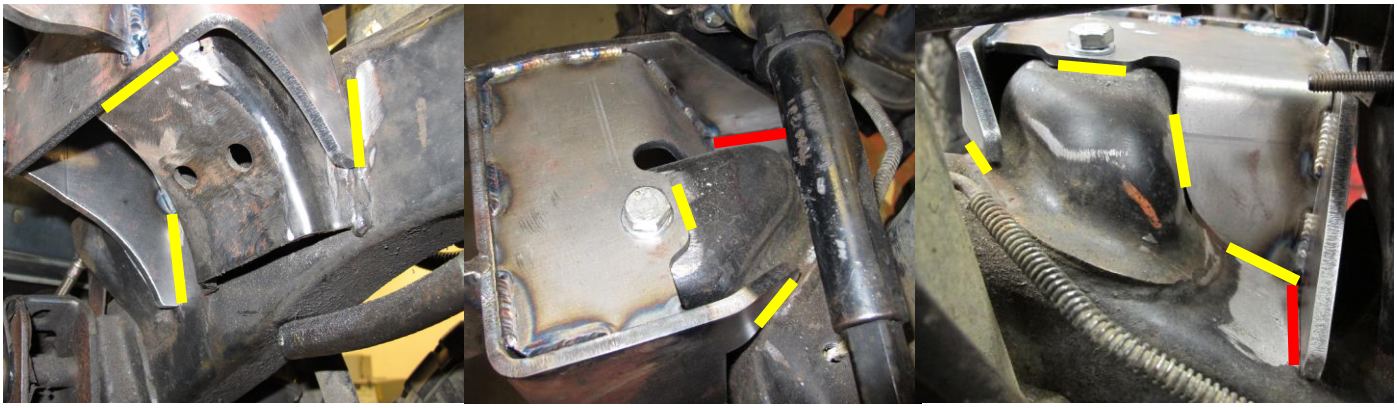


Image 7- minimum weld locations for the driver side engine mounting bracket

30. Once the frame/welds have cooled, paint the engine brackets and surrounding frame areas with a paint coating of your choice.

31. Re-install the engine, transmission and transfer case adapter in their previous positions and fully tighten all their attaching bolts/nuts.

32. Install the transfer case, transfer case linkage and front and rear drive shafts; you will most likely need new drive shafts and this would be a good opportunity to consult with a drive shaft builder to determine what specifications and features they would recommend for your application.

33. For emissions-legal swaps, install a set of stock LS or LT exhaust manifolds and catalytic converters (use of a body lift may be required to facility installation of such parts) that are permissible for use in this vehicle application. Other emissions equipment may also need to be installed in order to meet the requirements of an emissions-legal swap; check with your local governmental authorities to determine what equipment is required. Compatibility of the Hooker Blackheart LS/LT engine mounting brackets with any specific stock LS or LT exhaust manifolds has not been ascertained.

34. For off-road/racing installations on vehicles that will not be used, or registered for use, on public roads or highways, install the Hooker Blackheart Jeep Wrangler Hemi engine swap headers and Y-pipe per the instructions included with each of them.

35. Following the installation of the exhaust system components, install the radiator, fan and shroud, battery, A/C system components and engine/transmission controller and wiring harness.

36. Install the front fenders and any fender mounted components previously removed.

37. Refer to the Hooker Blackheart Jeep Wrangler LS-LT Engine Swap Technical Guide for more information that will assist you in competing the entire swap project.

COMPATIBILITY INFORMATION:

These engine mounting brackets replicate the stock 4.0L engine crankshaft centerline offset to the passenger side of the vehicle, which is the specific geometry needed to be able to install the Hooker Blackheart BH13209/BH13210 headers, BH13211 Y-pipe, and BH13212 exhaust system in this vehicle application. If needed, additional compatible LS and LT engine swap components, such as EFI fuel control systems, fuel filters, fuel pumps, and plumbing hose/fittings can be found at www.holley.com.

LIMITATION OF LIABILITY – DISCLAIMER:

The regulation of emissions production, noise levels, and safety standards is undertaken by the federal government, each of the fifty state legislatures, and by many local municipalities, towns, and counties.

HOOKER™ makes no warranties of merchantability, of fitness for particular purpose, or that its products are approved for general use, or that its products comply with laws, regulations, or ordinances in the state where they may be sold to the ultimate purchaser, the consumer.

Unless expressly stated to the contrary in the catalog, instruction sheet; or price list, the entire risk as to the conformity of any company product in any such state and as to repair should the product prove to be defective or non-conforming, is on the retail purchaser, the buyer, the ultimate consumer, of such product and it is not upon the seller, distributor, or manufacturer.

In this connection, the retail purchaser, the buyer, the ultimate consumer assumes the burden of the entire cost of any and all necessary service, alterations, or repair.

THE FOREGOING STATEMENT LIMITS THE LIABILITY OF THE MANUFACTURER.

California vehicle code, sections 27156 and 38391, prohibits the advertising, offering for sale, or installation of any device, which modifies a vehicle's emission control system, unless exempted, unless otherwise noted. HOOKER™ Headers that have not received an Executive Order (E.O.) exemption from these code sections are not legal for sale or use in California on vehicles originally equipped with catalytic converters, except for racing vehicles, which may never be driven upon a highway. Check with your local authorities to determine if these headers are legal for use in your particular area.

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Phone: 1-270-781-9741
For online help, please refer to the Tech Service section of our website: www.holley.com

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