

# essex

“Race Parts For Your Car”

## Rear Competition Brake System Installation Guide: 2020-Present BMW M2/3/4 rear Radi-CAL™ system



**Warning:** Essex Competition kits are for off-road use only. The components in these systems are not designed for use on public roads.

## Disclaimer of Warranty

By purchasing this product and opening this box, purchaser expressly acknowledges, understands and agrees that they take, select and purchase this brake system, parts, and equipment from Essex Parts Services, Inc., its affiliates, suppliers, distributors, and agents (collectively, "Essex") "as is" and "with all faults." The entire risk as to the quality and performance of this brake system, parts, or equipment is with the purchaser. Should the goods prove defective following their purchase, the purchaser assumes the entire cost for all necessary servicing or repair or any resulting liability. Essex is not responsible for any damage, consequential or otherwise, for equipment failure or mal-performance after installation.

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## Installation

The brake system on any vehicle is a safety device. It is strongly recommended that any personnel performing brake-related replacement or maintenance operations should be competent and certified, using proper tools and equipment.

## Brake to Wheel Clearance

This brake system is compact but the high offset design of some factory wheels prohibits their use without aftermarket wheel spacers and extended wheel studs/bolts. Some aftermarket wheels may fit over the brake kit without spacers but it is up to the consumer to verify that his or her wheels will work with the kit. Essex has wheel templates available for download at [www.essexparts.com](http://www.essexparts.com). ***The customer is solely responsible for verifying wheel fitment.***

## Brake Noise, Vibration, and Harshness (NVH)

Brake noise can be caused by many factors. Following the bed-in procedures outlined in this manual will help reduce brake noise to the extent possible, but keep in mind that high performance brake pads do tend to make more noise than typical OEM pads. The customer is solely responsible for any NVH related problems with the brake system (squealing, scraping, vibration, judder, etc.).

## Caliper, Bracket, and Hat Finish

Some components of this system are anodized aluminum, and as such are subject to corrosion when introduced to corrosive agents such as brake fluid, road salt, wheel cleaners, certain soaps, etc. Use caution when cleaning and servicing the system components.

# What's in the Boxes?

Your brake system is packaged in two separate boxes. With the exception of attachment hardware, driver (left) and passenger (right) components have been intentionally separated for ease of installation:

## Box One (Left/Driver)

### KIT #13.01.10176/-ENP

- AP Racing four piston caliper: anodized CP9449-3S4L; ENP CP9449-3S4LN
- LH disc assembly 13.04.20133: AP Racing J Hook brake disc CP5775-215GA with attached anodized aluminum hat (13.03.01134)
- Anodized aluminum caliper mounting bracket with studs 13.03.02075 non-EPB; (identical to the right hand bracket on this application)

### KIT #13.01.10195/-ENP

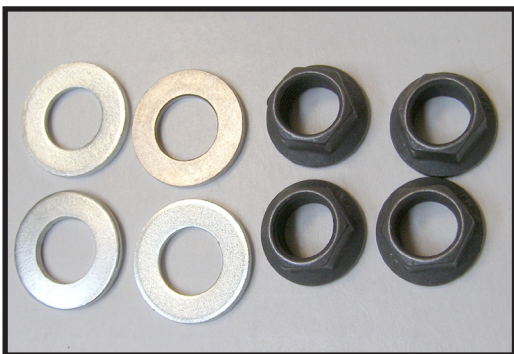
- AP Racing four piston caliper: anodized CP9449-3S4L; ENP CP9449-3S4LN
- LH disc assembly 13.04.20133: AP Racing J Hook brake disc CP5775-215GA with attached anodized aluminum hat (13.03.01134)
- LH Anodized aluminum caliper mounting bracket with studs 13.03.02099 for EPB
- Electronic parking brake caliper (20.05.10174)
- Parking brake caliper hardware kit (20.05.30037)
- Parking brake caliper pad set (20.05.30038)

## Hardware

- two 10mm washers for the bracket studs (#10 10154)
- two 10mm jet nuts for the bracket studs (#10.02.00001)
- Four M12 hex head caliper bracket mounting bolts (attaches caliper bracket to upright) (#10.02.00039 45mm - EPB delete, 10.02.00057 50mm - EPB included)
- Four M12 washers for the above bolts (#10 10156)
- One tube of Loctite 271 (red)
- One pair of rear Spiegler Stainless Steel Brake lines (13.02.10300 - EPB Delete; 13.02.15600 - with EPB), including rubber caps for sealing off brake hard line

### 13.01.10195 kits only:

- Four M10x1.5x85 hex head bolts for electronic parking brake calipers
- two EPB harnesses with pigtails for connecting to OE harness
- Four 14-16ga sealing butt connectors, (2) .1875" and (1).375" shrink tubing



## Box Two (Right/Passenger)

### KIT #13.01.10176/-ENP

- AP Racing four piston caliper: anodized CP9449-2S4L; ENP CP9449-2S4LN
- LH disc assembly 13.04.10133: AP Racing J Hook brake disc CP5775-215GA with attached anodized aluminum hat (13.03.01134)
- Anodized aluminum caliper mounting bracket with studs 13.03.02075 non-EPB; (identical to the right hand bracket on this application)

### KIT #13.01.10195/-ENP

- AP Racing four piston caliper: anodized CP9449-2S4L; ENP CP9449-2S4LN
- LH disc assembly 13.04.10133: AP Racing J Hook brake disc CP5775-214GA with attached anodized aluminum hat (13.03.01134)
- RH Anodized aluminum caliper mounting bracket with studs 13.03.02100 for EPB
- Electronic parking brake caliper (20.05.20174)
- Parking brake caliper hardware kit (20.05.30037)



## Required tools

Torque wrenches capable of 150in/lbs to 100 lb.-ft.

Breaker bar- OEM caliper bolt and wheel removal

E16 female torx-OE caliper carrier bolts

6mm allen/hex socket/key-disc retaining bolts, AP caliper bridge bolt

17, 19mm box wrenches and/or sockets/ratchet-caliper bracket to spindle bolts, EPB bolts

11mm, 14mm, 17mm, flare wrenches-brake line removal/installation

17mm socket- Wheel lug nuts

12mm socket- Caliper stud nuts

7/16"/11mm box end wrench- Caliper bleed screw

Wire snips/crimping tool/heat source - EPB installation only

Rags- Brake fluid

Scotchbrite or small wire brush-cleaning hub faces

Brake fluid cleaning solution

Small Funnel- Brake fluid

Eye protection

Gloves

2 or 3 500ml bottles of brake fluid- Essex recommends AP Racing R3 or R4 brake fluid

Pair of jack stands- If you can't figure this out, drop the other tools and walk away!

## Note on brake ducts

Essex cannot verify fitment or compatibility of our system with third-party brake duct systems, so please fit and use them at your own risk. If you do plan to use brake ducts in conjunction with our system, please **do not bolt anything between the caliper bracket and the upright**. The caliper bracket was precisely designed to bolt directly against the upright without any shims, spacers, etc. If you are bolting a brake duct to the upright, please attach it on the back side of the upright. Also, please make sure that you are maintaining enough thread engagement on the bolts holding the caliper bracket to the upright (part#10 10155).

## Installation procedure

### Step 1-Wash both brake discs with soap and water (skip if burnished)

If you purchased your system with burnished discs, skip to step 2. The discs in our system are coated with a water soluble rust inhibitor that must be removed prior to use. Use soap and water to clean them. Dish detergent works well. The discs will start to rust immediately (as they do when you wash your car), so please don't be alarmed when that occurs.

### Step 2-Lift and secure vehicle, remove wheel(s)

- Chock the front wheels, leave vehicle in neutral. Do not apply the parking brake. Shut off the engine.
- In the trunk, remove the floor panel and with a 10mm wrench/socket, disconnect negative battery cable.
- Place a rag or other obstruction over the latch so the trunk does not latch closed.

**DO NOT REPLACE BATTERY CABLE UNTIL ENTIRE PROCEDURE IS COMPLETE.**

**Connecting the battery before the system is fully installed/bled will throw an error code put the car in a limp mode that must be cleared with BMW service software before the vehicle can be driven at speed.**

- Put on your gloves and eye protection.
- Slightly loosen rear wheel lug nuts, but do not remove.
- Lift the rear of the car on a flat, clean, and stable surface per manufacturer recommendations.
- Secure the vehicle on two jack stands, or one if you'd like to install one side at a time.

**\*\*\*Never leave your vehicle supported with only a floor jack. ALWAYS USE JACK STANDS.\*\*\***

- Remove rear wheel(s).

### Step 3-Detach hard line brake connection

**Warning- Brake fluid is corrosive, flammable, and will damage painted and anodized finishes. Clean up all spills immediately.**

- Place a tray and/or rags below the brake hard line connection on inner fender well.
- Before removing the OEM brake line, take careful note (or a picture if necessary) of the routing. The Spiegler brake line included with our system will be installed in the exact same orientation.
- Using your line/flare wrench, disconnect factory brake line from hard line connection.
- Immediately cover the hard line attachment point with the provided black rubber caps to halt brake fluid loss.
- Use a small screwdriver, pliers or awl to pry off the clip holding the brake line to the bracket
- Cap the end of the OEM brake line to prevent brake fluid spillage with the supplied rubber line cap.

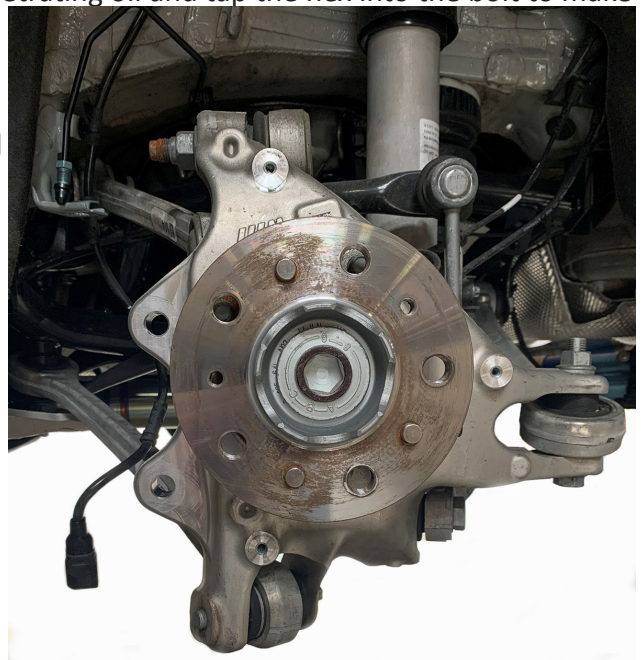


### Step 4 - Remove OE caliper

- Remove brake pad wear sensor (if applicable).
- Slide red tab over on parking brake connection, press tab and disconnect the connector from the parking brake caliper motor.
- Locate two caliper bolts holding the caliper to the upright. Using a E16 socket, loosen bolts and lift caliper off of the disc.

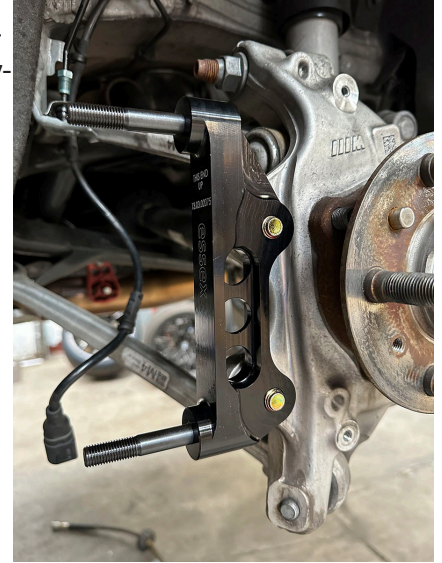
### Step 5 - Remove OE brake disc

- Remove disc retaining bolts with 6mm allen. Tip: Use penetrating oil and tap the hex into the bolt to make sure its completely seated.
- Remove OEM disc from hub.
- Using some scotch brite, cleaner (WD-40 works well) and rags, clean the hub face and flange to remove any rust and provide a nice clean and flat surface for your new discs to seat.



## Step 6 - Install Essex caliper bracket (13.01.10176)

- For maximum performance, Essex recommends removing the entire backing plate in order to improve air-flow to the disc. Using a 10mm wrench, remove the 3 retaining screws and remove the backing plate.
- Apply one small drop of red Loctite™ 271 (red) to the threads of the hex head bolts included with our system (#10.02.00039 45mm or 10.02.00054 50mm). Please be aware that excessive use of red loctite will make removal extremely difficult.
- Using a 19mm wrench and the supplied washers (#10 10156), attach the caliper bracket to upright in the orientation indicated on the bracket. Make sure that the bracket sits flat against the machined face of the spindle. **Torque to 70 lb.-ft.**



## Step 6 alt -install Essex caliper bracket with EPB (13.01.10195 kit)

- The ebrake calipers can be installed on either side of the vehicle. However, to protect the motor we recommend installing the RH caliper on the LH side and LH caliper on the RH side (see picture, driver's side/LH shown).
- Off the car, install the parking brake caliper onto the bracket using the M10 bolts (no washer) and a 17mm wrench/socket. Make sure the slider bushings recess into the pockets on the backside of the bracket. **Torque M10 bolts to 40 lb-ft.**
- Install the bracket with the EPB caliper onto the upright with the included 50mm long M12 bolts and washers. Due to possible production variances, make sure the bracket is sitting flat against the upright and is not interfering with any suspension bosses/components. **Torque M12 bolts to 70 lb-ft.**





## Step 7 - Install AP Racing J Hook racing brake disc

- Install the AP Racing Heavy Duty J Hook 2-piece disc over the wheel studs. To ensure proper airflow and cooling, make sure the discs are on the proper side of the car per the pics below. The J Hook slot pattern and internal vane design can both be used as reference points.

*Ex: Driver side/left hand brake disc:*

*Ex: Passenger side/right hand brake disc:*

Driver Side Disc



Passenger Side Disc

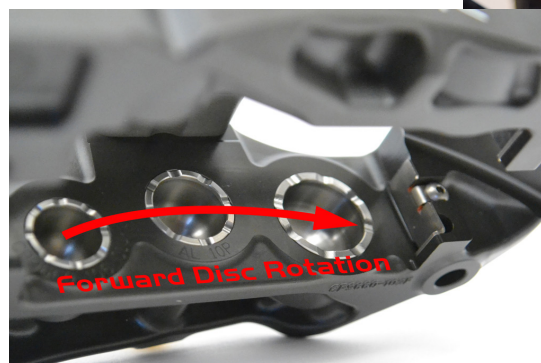


## Step 8 - Install AP Racing CP9449 rear brake caliper

- Verify that you are putting the proper caliper on the correct side of the car. The smallest piston should be the first piston in the direction of forward disc rotation.
- Using a 6mm hex wrench, remove the pad retention bolt from the top of the caliper.
- Slide caliper onto bracket studs making sure it seats flat onto bracket.
- Using a 12mm socket and the supplied washers (#10.02.00016), secure the caliper to the caliper bracket with the jet nuts (#10.02.00008).

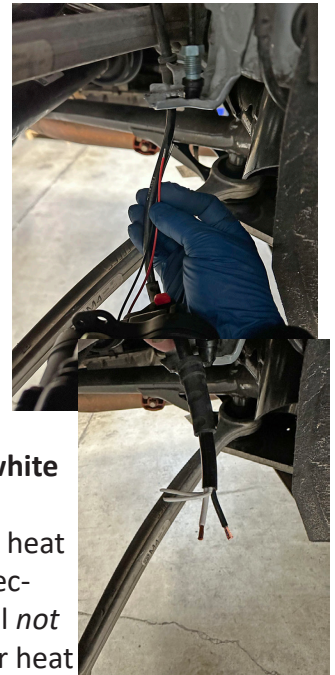
**Torque to 23 lb-ft.**

- If you are deleting the parking brake functionality, secure the OE EPB harness out of the way of any moving components with some wire ties.



## Step 9 - EPB wiring harness modification (13.01.10195 kits only)

- Using a pair of wire cutters, cut off the end of the OE parking brake harness off about 2.5" from the bushing that attaches to the body next to the brake hardline connection.
- On the vehicle side, strip a 1-1<sup>1/2</sup>" section of the outer black sheathing to expose the black and white wires inside the harness and strip about 1/4" of the wire sheathing from the ends to expose the wires. Disregard the two small white shielding wires.
- Grab the included wiring plug with leads and slide a piece of the smaller shrink tube leaving about 2" of the wires ends exposed. Then slide the larger black heat shrink over the smaller shrink tube as shown.
- Strip about 1/4" of sheathing off the ends of the pigtails.
- **Using the included butt connectors, connect the red wire of the supplied harness to the black wire of the OE harness and the black wire of the supplied harness to white wire inside the OE harness.**
- Once the connection is crimped and secure, use a heat source (butane torch, lighter, heat gun), to shrink the butt connector heat shrink which will seal off the individual connections, being careful *not*



tions, being careful *not* to shrink the larger heat shrink.

- Once the butt connectors are sealed, slide the larger piece of black heat shrink over both butt connectors and shrink it, along with the remaining heat shrink to complete the harness.
- Plug connector into EPB caliper and secure wiring from contacting other components with wire ties.

## Step 10 - Install Spiegler Stainless brake line

- Install the banjo bolt on the end of the brake line with a copper crush washer on both sides of the line banjo fitting. Hand-thread the bolt into the inlet port on the caliper. Route the line down and slightly inboard. Make sure the line does not contact any suspension or driveline components. Snug the banjo bolt so it won't leak.
- Insert the female end of the brake line into the bracket. Remove the rubber cap from the hardline and hand-tighten the tube nut into the female fitting on Spiegler line. Use the 13mm line wrench and 17mm box wrench to tighten the connection. Do not overtighten. Just make sure the connection is snug and leak free. Install retaining clip.
- Make sure the brake line is not touching anything, binding, or rubbing. If necessary, slightly loosen the banjo bolt at the caliper, and adjust the routing of the line until there is no interference and line has enough slack.
- If line seems twisted, use the supplied plastic blocks and a pair of pliers to twist fitting so that the line is not overly twisted. See brake line packaging for instructions.
- Once you are satisfied with the routing, torque the banjo bolt with a 14mm socket to **18-22 lb-ft.**

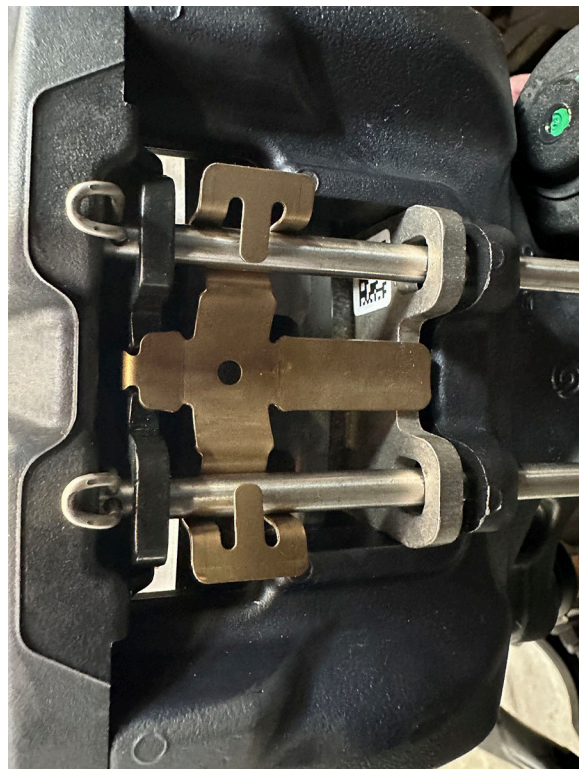


## Step 11 - Install brake pads (DO NOT SKIP THIS STEP)

- Slide the included AP Racing brake pads into the calipers.
- Make sure the pads sit flush or very slightly above the top edge of the disc and do not over hang by a large amount or sit low on the face. See picture to the right of properly aligned pads in the caliper.
- If you do not install your pads during this step, you will potentially have a big mess on your hands when you attempt to bleed your brakes!
- Using a 6mm hex wrench, reinstall the pad retention bolt removed in Step 7 above. **Torque to 115 in-lb (13.1 Nm)**

## Step 12 - Install EPB brake pads, clips and pins (13.01.10195 kits only)

- Grab the included parking brake pads and one hardware kit.
- Start by inserting the pins through the holes on the caliper body from the inside.
- Insert the pad without adhesive into the caliper on the piston side while continuing to push the pins through the ears to locate the pad (make sure the friction material is against the disc).
- Grab the pad rattle clip and install it as shown while pushing the pins through the caliper.
- Remove the protective backing from the pad with the adhesive and insert it into the the outboard side of the caliper with the friction material facing the disc, allowing the pins to go through the pad's ears and into the outboard side of the caliper. The adhesive will stick the backing plate to the caliper body.
- Push the "R" clips through the small holes in the pins to secure them into the caliper. The bends in the clips should rest over top of the caliper to prevent them from rotating.



## Step 13 - Repeat steps 3 thru 12 on the other side of the vehicle

## Step 14 - Bleed the brake system

For use with our system, Essex recommends AP Racing R3 brake fluid or AP Racing R4 brake fluid. Both are always in stock and available through Essex and our distributors. We recommend purchasing three bottles (standard 500ml size) of your preferred fluid to complete the installation.

The goal of bleeding the brakes is to remove all of the old fluid from the system, replacing it with your new fluid. With a single brake fluid reservoir (which your car has), fluid in the front and the rear of the car will mix. You therefore need to bleed all four corners of the car. The caliper bleeding sequence is to start with the corner of the car furthest from the master cylinder (mc), and work your way closer to the mc: Passenger rear, driver rear, passenger front, driver front. The proper bleeding sequence is the lower bleed screw, followed by the upper bleed screw. Use a 7/16"/11mm box end wrench on the caliper bleed screws, and an appropriate bleeder bottle (available through Essex).

When loosening and tightening the bleed screws during this process, just snug them and do not over-tighten. The final torque value on your last tightening of the **bleed screw should be 150 lb-in.**

- Make sure brake pads are secured in all calipers.
- Open the top of your brake fluid reservoir, and make sure it is mostly full. At no point during the bleeding process should you allow the level of brake fluid to go below the minimum level marking.
- Have some rags and brake cleaner handy, and place a drip pan or cardboard below the caliper you are bleeding
- Position your box end wrench over the lower bleed screw on the passenger rear caliper, followed by the hose from your bleeder bottle.
- With a friend behind the wheel and working the brake pedal, loosen the bleed screw and have your friend pump the brakes to the floor 5 or 6 times to flow some of the old brake fluid out of the system
- You should see some air bubbles flowing through the bleeder hose. Have your friend hold the brake pedal to the floor, and snug the bleed screw back up.
- Check the fluid in your reservoir, and refill to the max line if necessary.
- Tell your friend, "pressure." S/he will apply pressure to the brake pedal. Loosen the bleed screw. The pedal will slowly drop to the floor as fluid flows out of the bleed screw. When the pedal hits the floor your friend holds it there, and tells you, "down." Tighten the bleed screw. Repeat this process until no more air bubbles are flowing out of the caliper. On your friend's final press, close the bleed screw when his foot is half way to the floor.
- Check the fluid in your reservoir, and refill to the max line if necessary.
- Repeat this procedure on the upper bleed screw on the passenger rear.
- Repeat the above procedure in the prescribed caliper order, continually checking the fluid level in your reservoir. It will drain quickly, so keep a close eye on it.
- When you are done bleeding, wipe up any brake fluid on the calipers, lines, etc. with brake clean and rags. It will destroy the finish of any painted surface it touches.
- Fill your fluid reservoir to the max line and tighten the cap.
- Have your friend apply pressure to the brake pedal, while you examine the connections at all corners of the car for leaks.
- Due to the internal fluid passages in the Radi-CAL™ calipers, air can sometimes get trapped inside the caliper. We recommend doing a quick re-bleed of the calipers after the initial test drive to be sure all of the air is bled out.

**Please note: After bleeding the system, there will remain a small amount of residual brake fluid inside the bleed screws and/or around the threads. As the calipers heat up, this fluid will force its way out and may look like the calipers are leaking. This is perfectly normal and will go away after a short time. If you experience a spongy pedal or continue to see fluid leaking after a day or so then re-torque the bleed screws to the proper 150 in/lbs.**

## Step 15 - Install wheels/reconnect battery

Check wheel clearance before tightening. At times adhesive wheel weights inside the wheel barrel could potentially come into contact with your calipers.

Torque your wheels to manufacturer's recommendation.

Reconnect the negative battery cable and replace the trunk floor panel.

## Step 16 - Safety check

Drive the car at low speeds in a safe location to ensure proper functioning of the brakes.

## Step 17 - Bedding and preparation

Properly preparing your new brake pads before heavy use is extremely important. Please visit [www.essexparts.com/learning-center](http://www.essexparts.com/learning-center) for detailed bedding information in both written and video format.

The goal of bedding-in your brake pads and discs is to mate them together properly and prepare them for heavy use. When prepared properly, or bed-in, your pads will transfer a thin layer of material to the disc face (transfer layer). The pads in your caliper will then actually ride on that thin layer of pad material you've put down on the rotor, rather than rubbing directly on the iron rotor face. A good transfer layer is going to give you superior brake pedal feel, less noise, superior pad wear, and lower the chances of cracking your discs.

### Important Notes- PLEASE READ!

First, make sure you have a safe location to perform a proper bed-in. You need a stretch of asphalt with long straights, good visibility, and no potential obstructions. Make sure you are in a position to safely, legally, and repeatedly hit the necessary speeds to perform the bed-in procedure. A controlled racetrack is the best place to perform this procedure. AP Racing and Essex in no way suggest or condone speeding or breaking the law in your car, nor do we take responsibility for any damage or injury that occurs as a result of using our product or these procedures. You are performing the bed-in procedure at your own risk. For complete details, please read the Disclaimer of Warranty located on the previous page of this document.

### Bed-in Procedure:

**During these procedures, it's critical that you never come to a complete stop with your foot on the brake pedal.** If you have brake ducts on your car, you may want to block them off to allow your brake system to heat up easily.

The procedure outlined below is a generic procedure for most types of mild race pad. Please check your pad manufacturer's recommended bed-in procedure.

1. Accelerate to approximately 60mph and then decelerate down to 5 mph. If your car has ABS, you should try to hold the brakes at a point just before ABS intervention.
2. Once the car slows to 5mph, immediately accelerate back up to about 60mph, and brake again to roughly 5mph.
3. Repeat this series of stopping and accelerating 8 to 10 times. Again, do not come to a complete stop with your foot on the brake pedal.
4. Cool the brake system down by cruising at 45mph+ for 5 to 10 minutes.
5. Visually inspect your discs. They should be a blue/grey color (instead of shiny silver), and have an even layer of pad material across and around the entire rotor face.
6. If the pads don't have a layer of pad material on them, perform another series of stops in the manner outlined above.

For more details, photos, theory discussion, and video instruction on bedding-in brakes, please visit [essexparts.com/learning-center](http://essexparts.com/learning-center)

**Thank you again for choosing Essex and AP Racing. If you need any assistance, please call customer support at 704-824-6030 Mon-Fri 8am-5pm, or email [support@essexparts.com](mailto:support@essexparts.com)**



