TCRA & ATRA

A Strategic Alliance

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One of the acknowledged truths about any business is that certain alliances can improve your profitability.

This is by no means a unique situation; it carries into just about every type of business. And nowhere is the need for a strategic alliance more evident than the synergy created between the transmission repair shop and the torque converter rebuilder. Close ties between these two businesses can reduce problems and comebacks, and improve profitability for both businesses.

Here's an example of the benefits of one such alliance: The car is a late-model Honda. The transmission was burnt up, so the transmission shop rebuilt the transmission and installed a rebuilt torque converter.

Everything seemed fine for the first few weeks, but a month or two later the customer was back. The MIL was lit, and the computer had code P0740 in memory, indicating a slipping converter clutch.

So the transmission shop technician does what anyone would do: He checks the TCC operation. Sounds easy, doesn't it? But nothing appears to be wrong. He clears the code and drives the car. The code doesn't come back and the TCC seems to be working fine. His scan tool doesn't provide all that much information, but he can feel the converter clutch working, so he returns the car to the customer.

Within a few weeks it's back with the same P0740 code in memory.

So how does the transmission shop deal with this type of problem? Many would simply call their torque converter rebuilder and order a second converter. And, unfortunately, many of those shops would be seeing the car back again in a few weeks.

The smarter transmission shop technician recognizes the need to work

Two Cooperative Views for Diagnosing a Honda Converter Clutch Slip Code

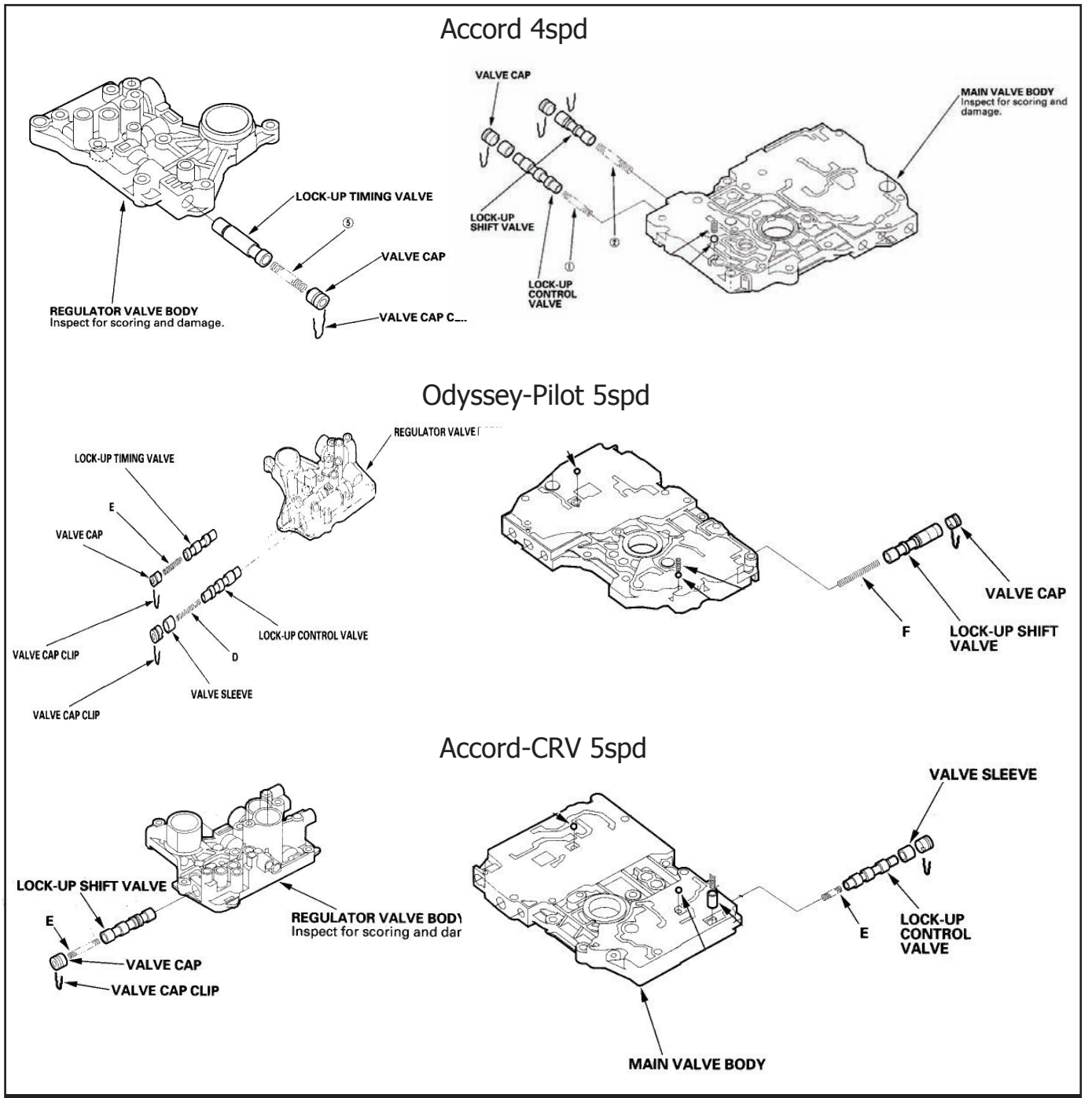

Figure 1: These are the valve assemblies that control TCC operation. Make sure they're clean and working properly, and the end plugs provide a good seal.

with the converter rebuilder. He'd know that a TCC slip can have a number of possible causes, many of which wouldn't be particularly obvious. And while the converter itself *could* cause this type of slip, there are also a number of transmission issues that could affect it too.

Let's take a look at the different

Figure 2: The black O-ring worked fine when the transmission was new, and none of the components were worn. But over time the combined component wear can allow the black O-ring to leak.

Figure 3: Always replace the black O-ring with the new, green O-ring. The green O-ring is thicker, so it compensates for small amounts of wear in the different components, providing a good seal.

conditions that can cause this specific problem, and look at them from both points of view: the transmission shop and the converter rebuilder.

The transmission technician's point of view will be provided by Bill Brayton from the ATRA Technical Department; Joe Rivera from ProTorque offers the converter rebuilder's point of view.

Honda Converter Clutch Slip: The Transmission Technician's View

by Bill Brayton

There are several issues you need to consider when dealing with a P0740 TCC slip code on a Honda:

Diagnosis — If you happen to have a dedicated Honda scan tool, you can check the difference between engine RPM and the mainshaft RPM. When the converter clutch is fully engaged, the speeds should indicate no slip at all.

Unfortunately most scan tools won't provide that level of information. If that's the case, you'll have to assume the computer is seeing some level of slip under certain conditions; you just won't be able to check them directly.

Valve Body — You should have disassembled and cleaned the valve body during the rebuild, so hopefully there are no problems there. While it'd be nice to check the valve body again, that's easier said than done on a Honda. Chances are you're not going to want to recheck the valve body until you've decided to replace the torque converter, since both jobs will require removing the transmission from the vehicle.

If you do end up pulling the unit again, pay particular attention to the valves that control TCC operation. On 4-speed units and 5-speed Odyssey and Pilot vehicles, these are:

- Lockup Shift Valve
- Lockup Timing Valve
- Lockup Control Valve

On 5-speed Accord and CRV vehicles, you'll only need to check these two valves:

- Lockup Shift Valve
- Lockup Control Valve

Figures 1 provides an exploded view of the valves that control TCC operation. Make sure these valves are clean and working freely. And check the end caps; these caps tend to loosen and leak. You can order special replacement end caps from Sonnax that include an O-ring to provide a more positive seal and eliminate end cap leaks.

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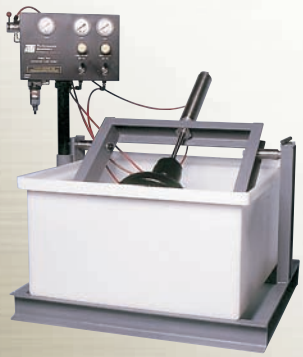

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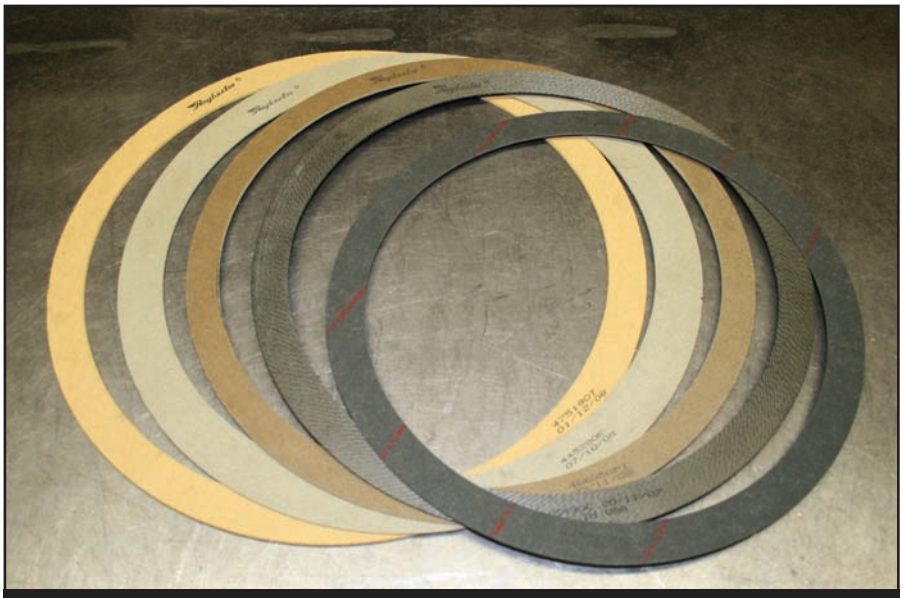

Figure 4: There are a number of different types of clutch facing available for today's converter clutches. The best way to make sure you're using the right type of clutch material is to ask your supplier for the proper application.

Figure 5: Never trust the temperature dial on your bonding press; check the temperature directly using a digital pyrometer, to make sure the clutch is reaching bond line temperature.

ATF — Improper transmission fluid can be a likely source of all types of transmission slips and chatters. The additives that alter Dexron for use in units requiring fluids with different friction characteristics work well, provided you begin with a quality base fill.

If you used Dexron and an additive and are now experiencing a slip or chatter, one of the first things you can try is to switch over to the factory fill; in this case, Honda fluid. It's been known to correct TCC slips on a number of vehicles.

CPC Solenoids — Damaged or faulty solenoids are another likely source of a TCC slip. Start by checking the solenoid resistance and operation. Make sure the solenoid closes completely and flows freely when it's supposed to.

If the unit was overheated or had severe metal contamination, you should replace the solenoids as a normal part of your rebuild procedure. Or if everything else checks out okay and code P0740 returns, replace the solenoids.

Here are the solenoids that control TCC operation:

4-Speed Units — CPC A and B
5-Speed Accord and CRV Vehicles — CPC A
5-Speed Odyssey and Pilot Vehicles — CPC C

Pump Gear to Converter Hub Seal — Honda units have an O-ring on the converter hub that seals the hub to the inner pump gear. Originally this was a black O-ring, with a diameter of 1.440" (figure 2). And this O-ring worked fine… when all the bushings and shafts were new.

But as the transmission components begin to wear, the original style O-ring no longer seals the converter charge oil properly. The problem is, there's no one item that's really worn enough to identify as being worn out; and replacing everything isn't a cost-effective solution.

The better choice? Replace the original O-ring with the new, green O-ring (figure 3). The replacement O-ring is 1.550" in diameter — 0.110" larger than the original, so it provides a better seal, even with the combined wear from the older components.

Finally, once you've decided everything else is okay and you need to replace the torque converter, call your converter rebuilder. Explain the situation and let him know what you've done so far. That way the rebuilder knows what to look for, and will have a better idea of what he needs to do to help eliminate the TCC slip.

Honda Converter Clutch Slip: The Converter Rebuilder's View

by Joe Rivera

There are a number of issues that can create a slipping problem in a Honda converter clutch:

Clutch Material Compatibility — There are several different types of friction material available for the

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Figure 6: The vast array of springs and rivets act as a heat sink, which can carry the heat away from the bonding process. That's one reason it's so important to check the clutch temperature directly.

Figure 7: Another easy way to monitor the clutch bond line temperature is to use a Tempilstik to mark the clutch piston. If the mark changes color, you can be sure the piston reached the temperature necessary for a proper bond.

converter clutch; size and price are no longer the only considerations (figure 4). One of the first things you should do when addressing any type of converter clutch performance problem is talk to your clutch suppliers. Find out what type of clutch material they recommend for the specific vehicle and converter you're working on.

Many of today's vehicles no longer use a simple off-on converter clutch. These torque converter clutches are now controlled by a pulse width modulated (PWM) or duty cycle signal. This provides the computer with more control of the clutch apply feel.

But in most cases, the plain paper clutch material won't provide the necessary holding power, temperature capacity, or the proper coefficient of friction to work with a pulse width modulated converter clutch system. These units usually require a high carbon clutch material to perform properly.

Most Honda transaxles use a pulse width modulated control strategy for their converter clutches. These clutches have a certain level of slip built into their control strategy. So it's important to use a converter clutch material with a high carbon content that can handle the additional heat being generated.

If you aren't sure which type of clutch control system is used in the vehicle you're dealing with, ask the transmission technician. He should be able to tell you just by checking the converter clutch solenoid resistance: PWM solenoids usually have a much lower resistance than the older, on-off solenoids.

Follow the Proper Bonding Process — The converter clutch material comes with the bonding adhesive already applied. Bonding the clutch to the piston involves a specific process of heat, pressure and time, which is provided by the clutch manufacturer.

That process isn't a suggestion, and close enough just plain *isn't*. It's critical that you follow the bonding process to the second… to the pound… and to the degree. Each clutch manufacturer has its own requirements; always contact them for the specific specs and procedures for their bonding adhesive.

- Check the pressure on your bonding press to make sure it's accurate, and adjust it if necessary. Consider adding a one-way check valve in the line feeding the piston to help maintain a constant apply pressure.
- Set a timer to make sure you're following the bonding duration instructions; don't guess about the time.
- Check the actual temperature applied to the clutch material with a digital pyrometer (figure 5); don't just assume the adjustment dial is accurate. This is called *bond line*

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Figure 8: Your first step in checking converter clutch clearance is to measure the height from the clutch release stop on the turbine hub to the bearing surface.

temperature; it's the temperature at which the adhesive begins to flow and bond to its contact surface. Most adhesives will reach their bond line temperature between 375ºF and 425ºF.

A few degrees too low… a few seconds too fast… a few pounds too little… and your clutch may not bond properly. This can allow the clutch to debond and fail during operation.

The temperature check is the difficult one to verify. First there's the clutch piston: Many, such as the Honda, have a very complex construction, including various springs, rivets and other hardware (figure 6). This hardware acts as a heat sink, drawing heat away from the clutch facing. So even if your bonding fixture's temperature is accurate, it's possible the temperature will never get high enough to bond the facing to the clutch piston.

And some bonding fixtures don't provide you with access to the clutch assembly during the bonding process, so you won't be able to check the bond line temperature until you're finished. In that case, check the clutch piston temperature immediately after you complete the bonding process. It should still be close to the recommended temperature for bonding.

You might want to test your bonding press beforehand using an old clutch piston. Install the piston assembly, and go through the bonding process. Then check the temperature immediately after releasing the pressure: If the clutch temperature is significantly lower than the manufacturer's recommendation, adjust the temperature dial and try again. Keep performing this test until you're sure your bonding press is bringing the clutch to bond line temperature. And recheck your press occasionally to make sure it's working properly.

An alternate test would be to use a Tempilstik to mark the clutch piston and check the bond temperature (figure 7). Tempilstik is a paint stick that changes color when you exceed its rated temperature. There are dozens of Tempilstiks available in a wide range of temperatures, so you should be able to have one available for every clutch manufacturer's temperature rating. Tempilstiks are available through MSC Industrial Supply Company, at www1.mscdirect.com.

Check the Clutch Release Clearance — The Honda converter clutch should have a clearance of about 0.015" to 0.035". Any less and the clutch could drag; any more and the clutch may not apply all the way.

Here's how to check the clutch clearance on the Honda converter:

1. Measure the height from the clutch release stop on the turbine hub to the bearing surface (figure 8).
2. Place the clutch into the front cover, and measure the height from the top of the clutch assembly (where it rides on the clutch release stop on the turbine) to the bearing surface (figure 9).
3. Subtract the first measurement from the second measurement.

So on the example unit, the first measurement was 0.770"; the second was 0.755".

0.770"
<u>–0.755"</u>
0.015"

- If the clearance is too low, you can machine the clutch mating surface to increase it.

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- If the clearance is too high, you can use a thicker clutch material.

Once you have the unit ready to assemble, you can check your clearance. To do so, you'll need six shims: three 0.015" shims and three 0.035" shims.

Place the three thin shims on the clutch (figures 10A & 10B), and slide the converter assembly together. Then check the clutch; it should rotate freely. If it's binding, even just a little, the converter clutch doesn't have enough clearance.

Pull the unit back apart, and place the three thicker shims on the converter clutch. Then slide the assembly together again, and check the clutch. This time it *should* bind; if not, the converter clutch has too much clearance.

IMPORTANT: Remove the shims before welding the converter together!

Once you have the clearance adjusted properly, you're ready to assemble the clutch. And you shouldn't have any problems with its performance.

While there are a number of transmission issues that can create a converter clutch slip, there are also many ways to slip up in the converter rebuilding process. The key is to follow the procedures to the letter. If you do that, you can virtually eliminate those converter clutch slip codes on Honda transaxles.

Two different approaches to a single problem: While there are a number of transmission issues that can create a converter clutch slip, there are also many ways to slip up in the converter rebuilding process. The key is to follow the procedures to the letter, and maintain open lines of communication between the transmission rebuilder and the converter rebuilder. If you do that, you can virtually eliminate those converter clutch slip codes on Honda transaxles.

Figure 9: Next, lay the clutch into place, and measure the height from the top of the clutch assembly (where it rides on the clutch release stop on the turbine) to the bearing surface.

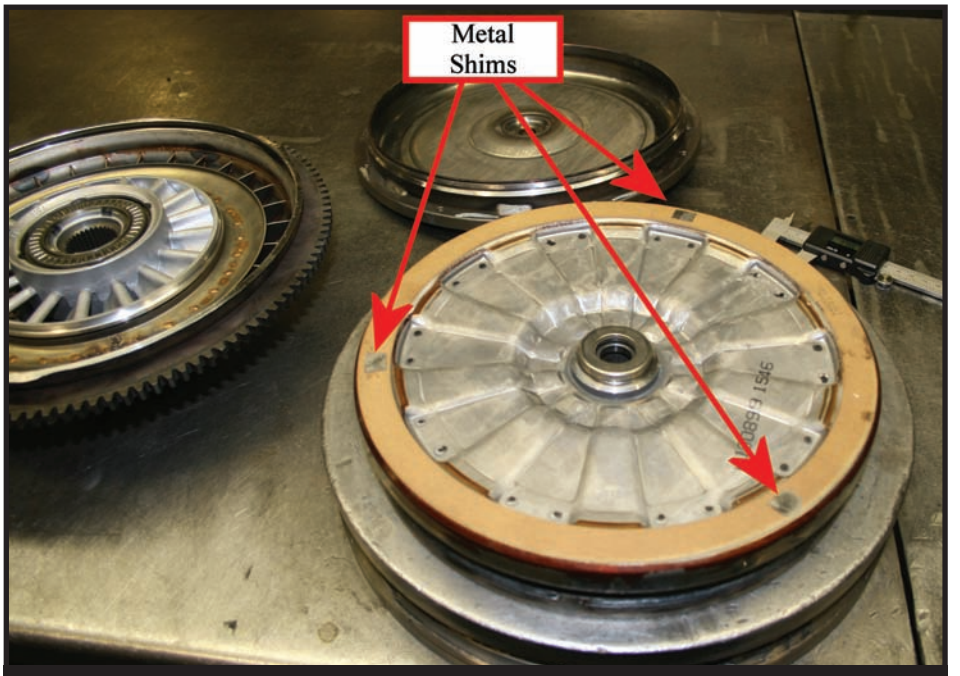

Figure 10A: You can check the converter clutch clearance directly by placing three shims on the clutch, temporarily assembling the converter shell, and checking the clutch clearance. Just make sure you remove the shims before welding the clutch housing!

Figure 10B

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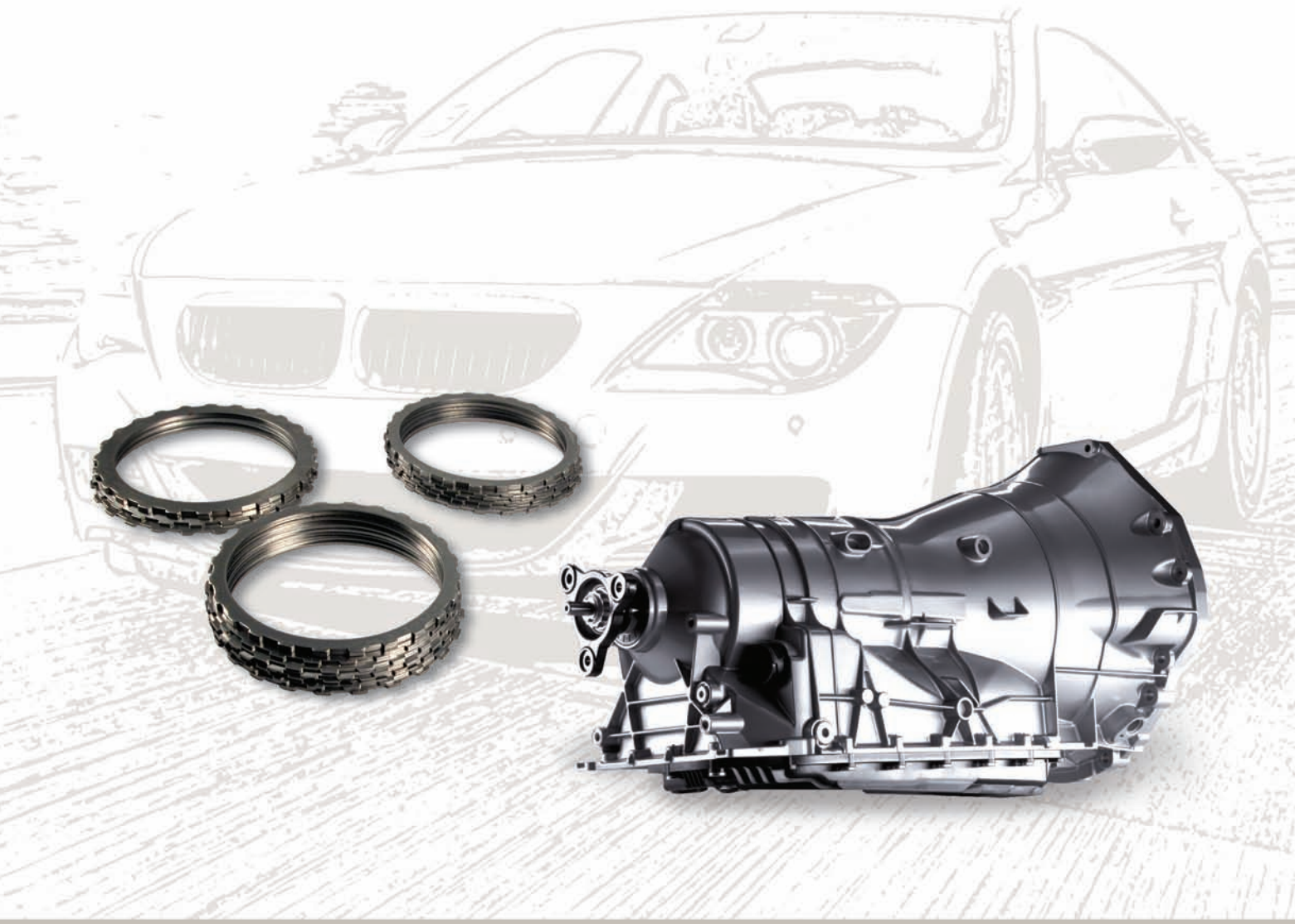

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