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Transmission Report

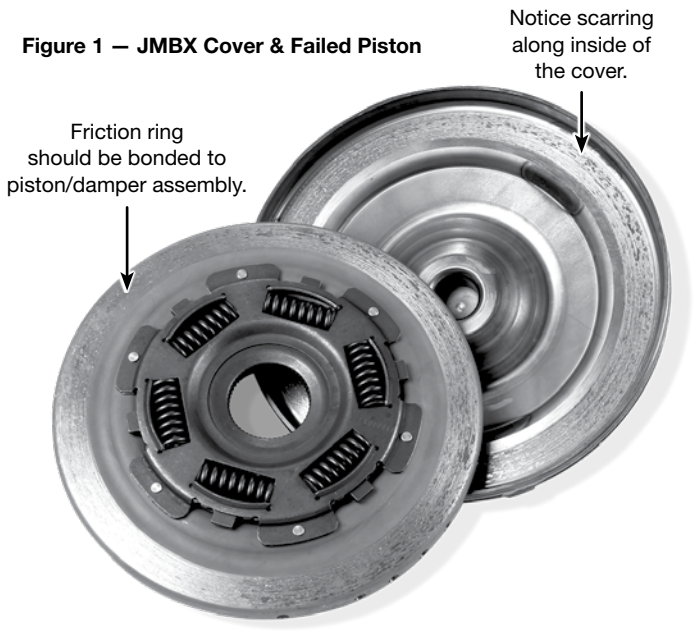
Volume 11, No. 2 April 2020

6L80, 6L90 Transmission Tech Advisory: Consider an Updated Converter in Your Next Rebuild

We all know that automatic transmission failures can have many root causes. Internal hydraulic leakage, hard part failures and contaminated/failed solenoids are all issues that can plague units, some more than others. Over time, technicians start to see the same patterns of failures in different families of units. For instance, transmission techs with any time under their belts can tell you all about 3-4 clutch failure in GM 4L60-Es, intermediate stub shaft failure in Ford 4R70Ws and solenoid issues in Aisin AW 55-50s.

GM 6L80 and 6L90 units are now starting to reach their prime age in the repair cycle, and techs across the country are starting to see a consistent pattern of transmission failures with full-size 6L80, 6L90 vehicles. So what's the most common failure that's seen time and again with these? Put simply, it's the converter. While it's true that, many times, the root cause of a converter failure lies in the transmission, in this case, there is ample evidence that the opposite is true: an inherent torque converter problem might be the root cause of a lot of the transmission failures.

Figure 1 — JMBX Cover & Failed Piston



A typical scene that's now playing out in transmission shops across the country goes something like this: A late-model, full-size truck or SUV is dropped off to get the transmission checked out. The check engine light might be on, and the customer complains of a slipping sensation with intermittent clunks. Upon a test drive and a scan, code P0741 is noted and the percentage of TCC slip shows to be way out of range. Drivability concerns are confirmed, and the pan is chock full of debris. The customer approves a teardown. Upon full inspection, the unit is loaded with metal, and the pump (bell housing) is worn to the point of needing remachining or replacement. The source of the contamination, however, is not readily apparent. You know where this is going — yup, it's the converter. While converter failures are not uncommon with other transmission families, you are thinking that this is really becoming a pattern for the 6L80, 6L90. And you are correct — the converters in these units are experiencing a high percentage of failure and are more problematic than normal. So, what's the unique problem with the 6L80, 6L90 converter found in full-size vehicles?

Before answering that question, it's worth noting the role that Sonnax plays in the converter rebuilding business. In addition to developing innovative, quality repairs for transmissions, Sonnax is also the premier, full-line supplier of components to the torque converter remanufacturing industry. As such, Sonnax has a good view of "both sides of the pump," so we are intimately involved with engineering solutions to both trending transmission AND converter issues.

Most full-size trucks and SUVs with a 6L80, 6L90 use a JMBX full-size (300mm) style converter. It's a single-disc, non-captive clutch unit that is somewhat similar to late 300mm 4L60-E converters. When cutting the JMBX open, converter rebuilders report that a high percentage of units show extreme damage due to the clutch piston and front cover crashing into each other **(Figure 1)**.

Continued on page 2...

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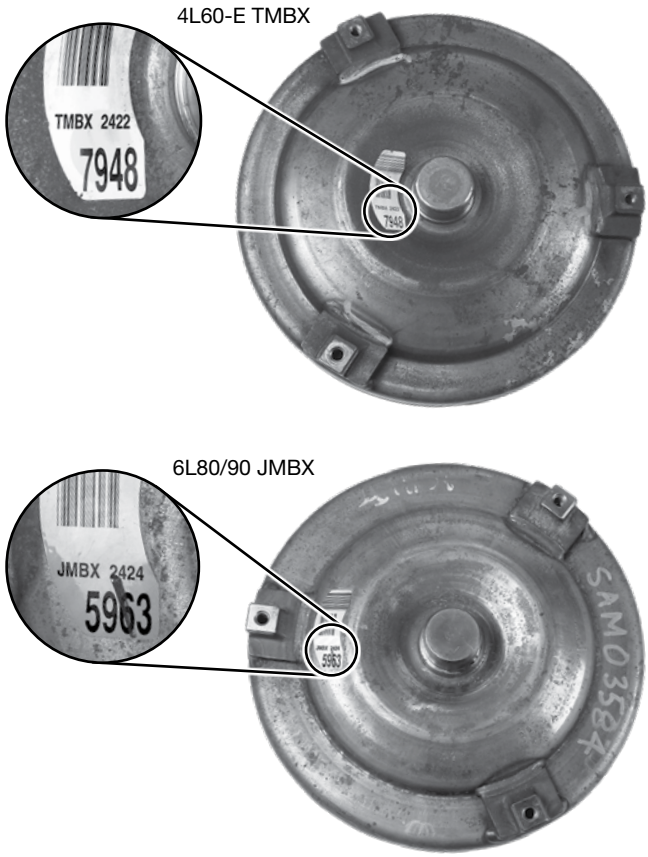
The OE cover and piston are damaged to the point of not being reusable — this is where all of the metal you find in the transmission comes from! At this point, the converter rebuilder is faced with either finding another core that he hopes will have good components or purchasing a Sonnax forged cover (**GM-CC-13**) and forged piston (**GM-DA-17P**). This drives up the price of the rebuilt converter, but ensures that this kind of failure won't happen again.

So why does the JMBX converter have this chronic problem? As transmission builders know, it can be difficult to determine a root cause when you are looking at a catastrophic failure, with rotating parts crashing into each other. By the time a converter rebuilder opens up a JMBX, the damage is done, and it can be hard to see what happened first. Did the converter clutch material just wear out, thus allowing the clutch and cover to go metal-on-metal? Or did the OE stamped steel cover and piston flex and twist to the point that the clutch surface was not flat, causing a premature friction failure? What came first: the chicken or the egg?

To be honest, we aren't 100% sure of the real reason for JMBX cover and piston failure, but we do have a theory. As we have all learned with other units, very often the root cause of a converter clutch failure stems from a failure within the electro/hydraulic controls from the transmission. That certainly holds true for the 6L80, 6L90. If there are worn valves or faulty inputs or controls, it's easy to see how the clutch could start to shudder and quickly fail. But in the 6L80 JMBX, we started to look very closely at the converter itself to see if we could determine a root cause. In doing this, we evaluated another GM unit — the 4L60-E TMBX — to see if we could pick up any clues. Looking at the two different front covers from the OUTSIDE, they are very similar, with just a few minor differences **(Figure 2).**

Both covers have very similar profiles and thicknesses, and you would not expect that one would be any more prone to flex or distortion than the other. But it's interesting to note that there is a very low cover/piston failure rate for the 4L60-E TMBX converter. The TMBX and the JMBX have similar covers and use the same woven carbon friction material, yet the JMBX fails catastrophically at a very high rate and the TMBX cover rarely fails. Why is that? To give you a sense of scope, for every single forged replacement cover that Sonnax sells for the 4L60-E TMBX, we sell many, many more for the 6L80/90 JMBX.

Figure 2 — 4L60-E TMBX & 6L80/90 JMBX Front Covers



And Sonnax doesn't even offer a forged clutch piston for the TMBX — there just isn't any demand for one. However, if you look beyond the outside of the front covers of TMBX and JMBX and look inside the units, the similarity quickly disappears.

A sectioned image of the 4L60-E TMBX and 6L80, 6L90 JMBX **(Figure 3)** shows the external profiles of the respective front covers are very similar. But look at the clutch pistons and spring dampers — they are markedly different. It's a little tough to see, but the thickness of the pistons is also different. For the 4L60-E TMBX, the pistons are .115" thick, and for the 6L80, 6L90 JMBX, the pistons are significantly thicker at .150". Comparing the two cross sections, you also quickly see that the orientation of the spring dampers is different. In the TMBX, the damper is on the transmission side of the clutch piston, and in the JMBX, the damper is located on the engine side of the piston. To achieve this flip-flopped damper orientation in the JMBX, the profile and shape of the piston is radically different from the TMBX.

Our theory as to why 6L80, 6L90 converters fail like they do is related to the shape and thickness of the

Consider an Updated Converter in Your Next Rebuild

JMBX piston. The thought is that the "bowl" shape of the TMBX is better suited towards a more even apply, and because it's thinner, the TMBX piston has the ability to flex and better conform to the front cover. One needs to realize that the stamped covers are not all that flat to begin with. It appears that GM has put a very minor taper into the cover and possibly the piston as well. The taper may exist so that the clutch surface goes flat when the cover is welded together — we're not sure. Remember, this is just a theory.

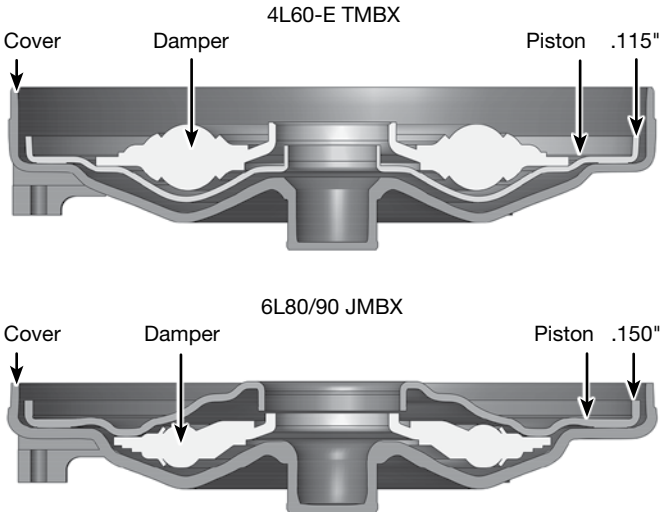
In any event, precise coordinate measuring (CMM scans) of a variety of JMBX covers shows that the covers are "wavy" and have undulations on the clutch surface, especially opposite of the welded cover pads. This "wavy" nature of the clutch surface is made worse with many miles of usage. The bottom line: The very thin (.020") woven carbon friction material can't survive the way the JMBX piston applies. The thicker JMBX piston can't conform to the cover (like it can in the 4L60-E TMBX), and at a commanded slip rate of approximately 50 RPMs in lockup, there is ultimately metal-to-metal contact that occurs between the front cover and the piston. Once there is any metal-to-metal on the TCC surface at all, it's usually a short time before debris wipes out the clutch completely.

This theory explains:

1. Why the thin woven carbon clutch doesn't typically fail in the 4L60-E TMBX.
2. Why it does fail in the 6L80, 6L90 JMBX.
3. Why the Sonnax forged covers and pistons solve the problem.

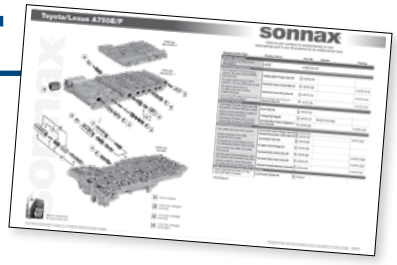
How do Sonnax components prevent the failure that plagues these units? It all comes down to the extra rigidity and flatness of the surfaces. As a transmission rebuilder, you know that flatness and rigidity of both apply and reaction surfaces are key to long clutch life in transmission clutch packs — it's the exact same in the torque converter. The Sonnax forged covers and pistons are designed to be flat and will stay that way through the forces of converter welding, miles of driving and varying input torque from the engine.

Figure 3 — 4L60-E TMBX & 6L80/90 JMBX Converter Cover Cross Sections



It's valuable to know that the debris you are seeing in the pans of all of those 6L80 and 6L90 units is very often from converter failure. If you are tearing down a new job and can't find any hard part failure that would result in the amount of metal you have in the pan, it's just about certain that the inside of the torque converter looks like the disaster area shown in **Figure 1**. As you build the best transmission that you can for your customer, you should consider including an updated torque converter in the repair estimate. A JMBX torque converter rebuilt with a Sonnax forged cover and piston has proven to be a successful recipe for a long-lasting unit, preventing this typical pattern failure. Knowledge is power — use it to protect your customer, your unit and yourself for miles and miles to come.

Valve Body Layouts Get a Makeover



To help make Sonnax valve body layouts easier to digest, we've revamped them to appear just as they have in recent catalogs. They're easier to read and print and are updated every time we release a new part. So, all of the information you've come to rely on can be at your fingertips! Each layout:

- Displays an exploded view location guide for individual valve trains
- Identifies symptoms and recommended solutions for quality rebuild
- Provides active links to view specific part details
- Lists any tools/fixtures required for part installation
- Illustrates correct part orientation

View all of these great guides at www.sonnax.com/valve_body_layouts

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Gen. 3 6T40: The Third Time's the Charm, Right?

What's Changed & What's Stayed the Same

Starting in 2014, GM released the third generation of the 6T40 transmission family. Commonly referred to as Gen. 3 6T40, the unit designations are 6T35, 6T31, 6T41, 6T46 and 6T51. The good news is that there were no changes to the valve body assembly from the previous second generation. Since these valve bodies can be interchanged, any Sonnax valve solutions that fit the Gen. 2 also fit the Gen. 3. For clarity, our popular "Gen. 2" Zip Kit® has been given the new part number of **6T40-GEN2-3-ZIP**.

It's important to note, however, that the Gen 3. pump design is completely different than the previous generations. While Gen. 1 and Gen. 2 utilized a gerotor-style pump that mated directly to the converter hub **(Figure 1)**, the Gen. 3 pump assembly uses a small secondary axis vane pump to drive a chain and sprocket mated to the converter hub **(Figure 2)**. This structural change to the pump, of course, means that none of the Gen. 1 or 2 pump valves **(Figure 3)** interchange with the Gen. 3 design.

Sonnax does have a new vacuum test guide available for the Gen. 3 that should help you identify any wear in the pump that may cause pressure, lube, converter and shift concerns. You can easily find this and other free guides by visiting www.sonnax.com/vacuum_testing.

Sonnax 6T40 Valve Body Repairs

Part No.	Part Name	Gen. 1	Gen. 2	Gen. 3
6T40-ZIP	Zip Kit®	✓		
6T40-GEN2-3-ZIP *Formerly Known as 6T40-GEN2-ZIP*	Zip Kit®		✓	✓
104740-09K	Compensator Feed Regulator Valve Kit	✓		
144740-02K	O-Ringed End Plug Kit		✓	✓
144510-14K	O-Ringed End Plug Kit	✓	✓	✓
144740-01	Oversized Actuator Feed Limit Valve*	✓		
144740-22	Oversized Clutch Boost Valve**	✓	✓	✓
144740-16K	Oversized TCC Regulator Valve Kit**			

*Requires a tool kit.
**Requires a tool kit and the VB-FIX reaming fixture.

Figure 1 — Gen. 1 & Gen. 2 Gerotor-Style Pump

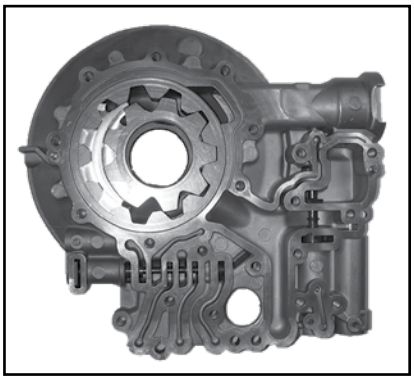


Figure 2 — Gen. 3 Pump

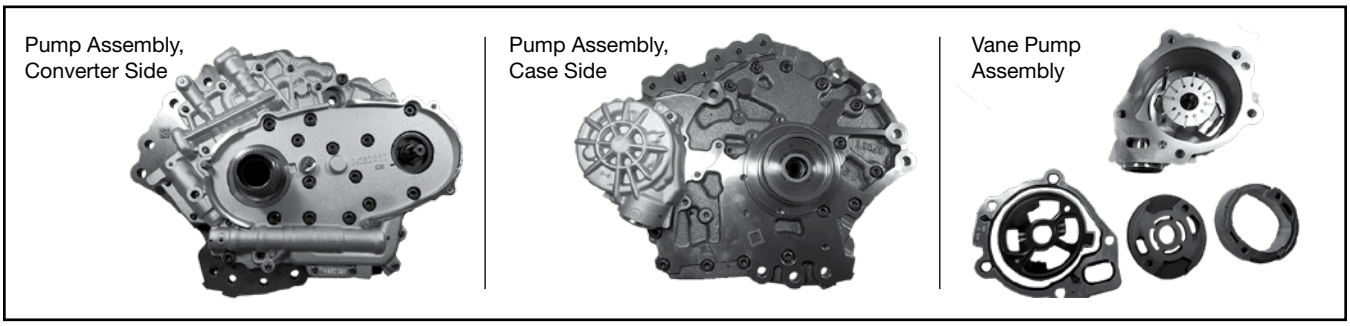


Figure 3 — Sonnax 6T40 Pump Body Repairs

Part No.	Part Name	Gen. 1	Gen. 2	Gen. 3
144510-01K	Oversized Pressure Regulator Valve Kit	✓		
144510-12K	Oversized Pressure Regulator Valve Kit		✓	
144510-05K	Oversized TCC Control Valve Kit	✓	✓	

Big Units Don't Have to Mean Big Costs with These AS66/69RC Valve Kits

NEW!

Starting in 2013, a more heavy-duty transmission than the 68RFE became available for RAM HD 3500/4500/5500 trucks: the AS69RC (diesel) and AS66RC (gas). In '16-later Nissan Titan XDs, it's the RE6R01A (A466ND). These are big units that come with a big repair price tag as well. A replacement OE valve body will cost you $1,000 or more, so you'll definitely want to check your core for significant wear areas and repair it instead.

Severe wear of the B1 and B2 apply control plunger sleeves can result in 1-2 and 5-6 flares as well as burnt B1 and B2 clutches. These sleeves are used in the same two valve body locations in both gas and diesel vehicles. Bore wear can be detected visually or by vacuum testing. Sonnax now has B1/B2 apply control plunger valve kit **122740-01K** **(Figure 1)** available as a drop-in fix.

The secondary pressure regulator plunger valve sleeve is also commonly worn, resulting in TCC codes, converter shudder, overheating and low SLT pressure. While similar between gas and diesel applications, there is a size difference on the plunger valve to watch out for to avoid incorrect converter charge pressure. Sonnax now has secondary pressure regulator plunger valve kits **122740-03K** for the AS66RC (gas) and **122740-05K** **(Figure 2)** for the AS69RC (diesel) applications — both are drop-in fixes.

Another location that always shows extreme wear is at the pressure regulator valve. In this heavy-duty application, not only does the bore show significant wear, but the valve itself is prone to side-loading, with the soft anodization scrubbing off **(Figures 3 and 4)**. Sonnax has developed oversized pressure regulator valve kit **122740-07K** for the AS66RC/AS69RC that features a hardcoat anodized valve with increased contact area at the wear-prone spool to prevent future wear. Effectively repairing this location requires reaming the bore to eliminate the wear that leads to high/low line pressure, poor shift quality and burnt clutches.

These cost-effective solutions will get the valve body repaired at a fraction of the cost of an OE — allowing you to get your customer's truck back on the road quickly.

Figure 1 — B1/B2 Apply Control Plunger Valve Kit

Part No.
122740-01K

Figure 2 — Secondary PR Plunger Valve Kits

Part No.
122740-03K
Fits gas units only with .255" dia. plunger valve.

Part No.
122740-05K
Fits diesel units only with .321" dia. plunger valve.

Figure 3 — AS69RC PR Valve Bore Wear

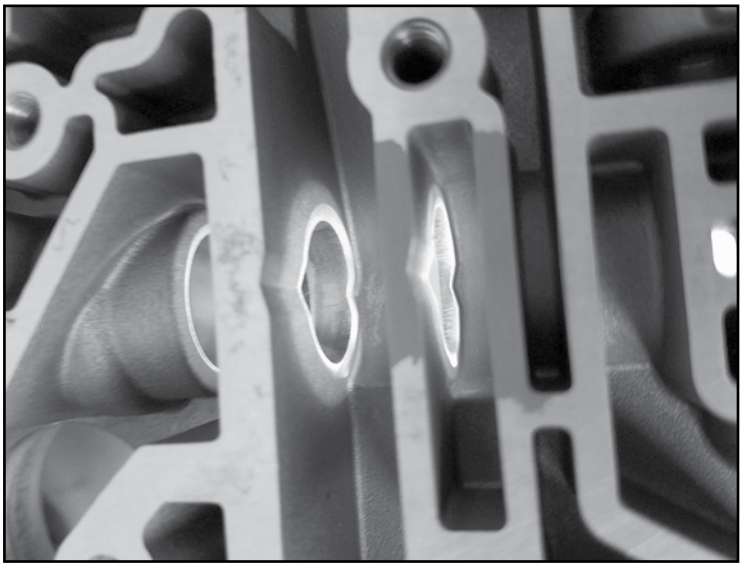
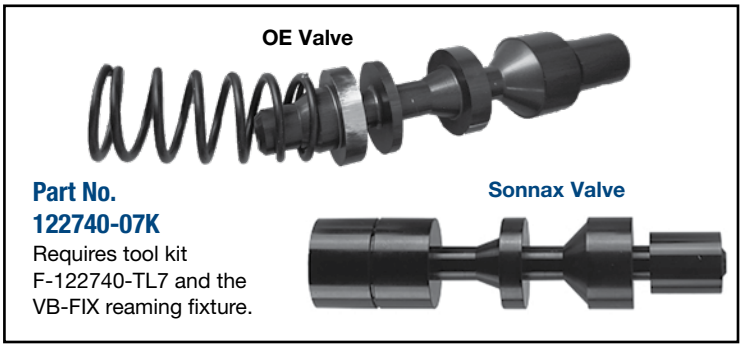


Figure 4 — Sonnax Hardcoat Anodized Oversized PR Valve vs. Worn OE Valve



Part No.
122740-07K
Requires tool kit F-122740-TL7 and the VB-FIX reaming fixture.

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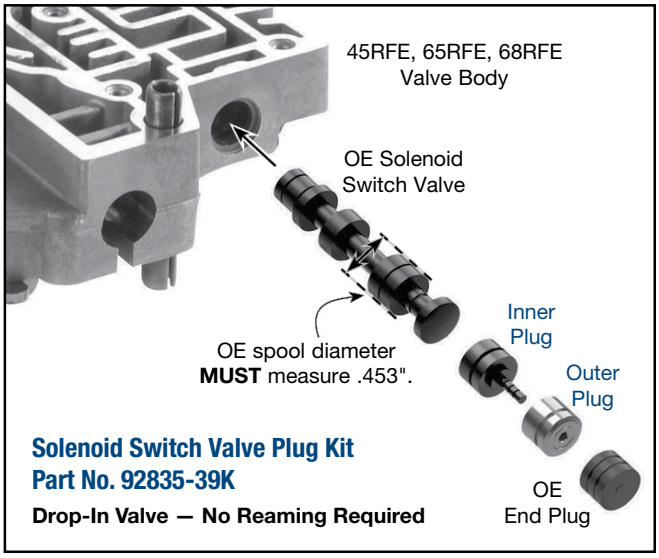
New Chrysler Drop-In Solenoid Switch Plug Kit Available

NEW!

Sonnax's patented solenoid switch valve plug design for various Chrysler applications has a new member of the family! Sonnax solenoid switch valve plug kit **92835-39K** is a drop-in kit for the OE .453" switch valve spool that fits Chrysler 40/41/42LE/42RLE, 62TE and 45/65/66/68RFE units.

For bores with minimal wear, this plug kit is a great solution for preventing the chronic cocking of the OE or other aftermarket plugs within the bore. This quick and easy, no-reaming approach is the first step to eliminate various TFP switch trouble codes, burnt OD clutches, fail-safe mode and various converter complaints and codes.



Solenoid Switch Valve Plug Kit
Part No. 92835-39K
Drop-In Valve — No Reaming Required

For bores with significant wear in the plug area or inboard switch valve location, Sonnax also offers oversized kits **92835-22K** or **92835-31K** that allow you to salvage the valuable casting.

Sonnax also has these same styles of kits for the .420" solenoid switch valve spool applications. Visit www.sonnax.com for more information on these unique, patented solutions.

You Asked, Sonnax Listened: Introducing Updated Solenoid Spacer & Service Kit

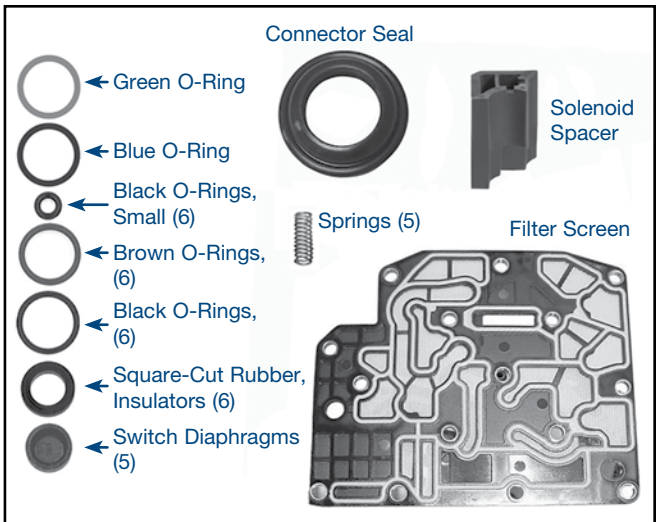
NEW!

Sonnax solenoid repair and spacer kit **44836-01K** has long been popular with techs who prefer to rebuild their own solenoid packs for 62TE and 45/65/66/68RFE units. The spacer prevents circuit board flexing that can lead to pressure switch codes and eventual board failure, and the kit includes insulators, diaphragms and O-rings to refresh sealing ability.

Due to feedback from valued customers like you, we improved this kit by adding components that you need to effect a complete teardown and rebuild one of these solenoid packs:

- A case connector seal
- Five pressure switch springs
- An OE filter screen

Adding these parts allows you to completely refresh your solenoid assembly without having to source these key components elsewhere. To help make sure you get the updated kit the next time you place an order, we've obsoleted the old kit's part number. Ask your distributor for the NEW solenoid spacer and service kit **44836-02K** and keep the feedback coming! We always appreciate suggestions for improving Sonnax products.



Solenoid Spacer & Service Kit
Part No. 44836-02K

Andy Jessiman

Product Support Representative

Andy's Years on the Team: 1

Andy Jessiman has owned and worked on many cars since he started driving, always wanting to improve over the OE whenever something needs to get replaced. He has three years of service experience at an automotive dealership. He joined us in fall of 2019 wanting to further his automotive career and has been quick to get up to speed on our product offerings since joining the team. Outside of work, Andrew is on a pit crew for a local modified race car driver. He also enjoys snowboarding and fishing. Give him a call today for all your Sonnax product support needs!

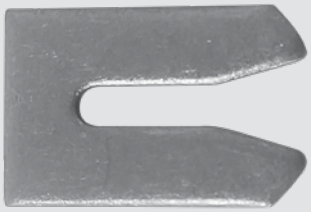
Need Support? We're Here to Help!

- Call **(800) 843-2600, Ext. 398**
- Use the "Contact Us" form at **www.sonnax.com**
- Send an email to **sonnaxtechsupport@sonnax.com**

Conquering the GM Compensator Clip Conundrum

As the compensator feed regulator bore in GM 6L45/50/80/90 and 6T40/45/50 units wears over time, it can cause timing issues for the application of clutches, which often lead to harsh shifts, bump shifts, flares, burnt clutches and, in extreme cases, overheated fluid. Sonnax compensator feed regulator valve kit **104740-09K** has proven an effective, time-tested solution to this problem. Because the kit can be used in both front- and rear-wheel-drive units, it pays to note a slight — but important — difference in installation methods between 6L and 6T valve bodies. In particular, the details of the retainer clips must be considered.

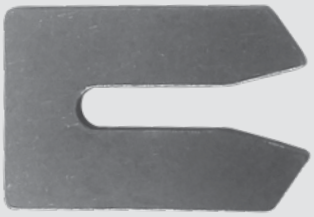
Figure 1



OE 6T40/45/50 Retainer .077" Thick

Although the bores are the same in 6L and 6T units, the thickness of the casting walls is slightly different. In 6L valve bodies, the installed Sonnax sleeve leaves enough room to reuse the OE retainer clip with ease. If you try to use the Sonnax clip instead, it will end up sticking out too far, preventing the castings from bolting together.

Figure 2



Sonnax 6T40/45/50 Retainer .060" Thick

6T40/45/50 units allow the Sonnax sleeve to protrude just far enough outboard that the factory clip is often too thick to be reused **(Figure 1)**. This is why we include a custom retainer clip in the kit; it is slightly thinner than the OE clip to compensate for this minor dimensional change **(Figure 2)**. If your memory is anything like mine, you may have to run into the issue a couple times before you remember these details without checking reference material. Rest assured if you can't remember, we are always here to help.

Give us a call or check out instructions at www.sonnax.com for this and all Sonnax kits and parts.

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Transmission Report

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Featured in this Issue

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Sonnax is an industry leader in the cutting edge design, manufacture and distribution of the highest quality products to the automotive aftermarket, commercial vehicle industries, and industrial sectors utilizing drivetrain technology.

Sonnax Hauls in Top Products & Tools!

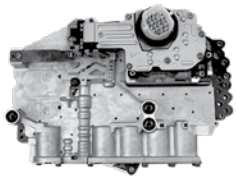
Every year, *Transmission Digest* accepts nominations for the top 10 products and tools in the powertrain aftermarket. Readers vote for their favorites to determine the winners. This year, Sonnax captured four Top 10 Products and two Top 10 Tools. **THANK YOU!**

Top 10 Products

GM Gen. 2 6T70/75/80
Zip Kit®
Part No. 6T70-G2-ZIP

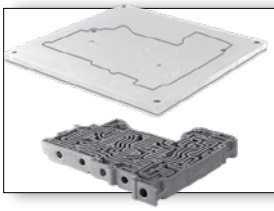
GM 6L80, 6L90 (300mm)
Front Cover
Part No. GM-CC-13

Chrysler 47RE/RH, 48RE
Smart-Tech®
Big Input Shaft Kit
Part No. 22121B-08K

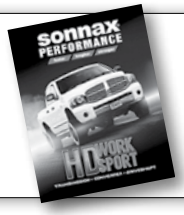


Chrysler 45/545/65/66/68RFE
Universal Remanufactured Valve Body
Part Nos. CHR145, CHR146

Top 10 Tools



Allison® 1000/2000/2400
Vacuum Test Plate Kit
Part No. 37000-VTP



Heavy Duty Work/Sport Catalog
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