TECHNICALLY *speaking*

Living with EC³: The Identification Process.

Just in case you haven't heard, GM has a new strategy for controlling torque converter clutch operation. It is called "Electronically Controlled Clutch Capacity" (ECCC), or EC³ for short. In a nutshell, the converter clutch is now applied in 2nd gear and it is allowed to slip all the way through to about 55mph, where it will engage fully. This is different from the first PWM TCC, where the TCC was "slipped" or "ramped" on over a short period of time (perhaps a second or two). When GM went to the PWM TCC system they also introduced a new high carbon lining for the converter clutch. This was done in order to handle the extra heat produced by this new, gentler apply strategy. In both cases, the rate of apply is controlled by varying the duty cycle of the converter PWM solenoid. By the way, the converter PWM solenoid on the 4L60-E is the same part as the 3-2 downshift control on the earlier non-PWM units. (The 3-2 solenoid on the later units is a simple on/off.)

Not all units marked "PWM" are EC³, but the transmissions are virtually identical. Only the TCC control program in the computer is different. The reason it is important to know if your PWM unit is using the EC³ strategy is that, once again, the torque converter clutch lining has been changed to handle the heat created by the constant slipping. It is now made from a woven carbon material that looks a lot like black denim. If you use a converter with a paper or high carbon lining in this new system, it will fail in a very short time.

Many of you have been blocking the TCC regulator valves on the PWM 4L60-E's with a heavy spring and using regular 700 converters. Although this practice does not address the real problem (worn valves), it is a relatively harmless modification. Many kit manufacturers even include the spring in their kits. You will not get away with it on the EC³ units. The TCC will come on abruptly on top of the 1-2 shift, and customers will never buy it. The opposite problem occurs when a woven carbon converter is used in a non-EC³ application. The TCC either chatters or engages harshly. So much for throwing an EC³ converter in every unit and not worrying about it! Besides, these new converters are still pretty rare. Converter builders are not going to let them go readily without a like-core exchange. It is interesting to note that so far there is no aftermarket source for the woven carbon clutch material. The only source is "good used." Fortunately, the material is almost indestructible and, barring damage from mechanical failure, is usually reusable.

The problem thus far has been in identifying the vehicles that use the new strategy and therefore need the woven carbon converter. Information regarding converter or transmission codes has been scarce and unreliable at best. We do now have some information regarding converter code stickers. There are several other methods of identification that you may need to employ if you are unlucky enough to have a missing sticker or you think that the converter may not be original. I will try to touch on all of them and explain the pros and cons.

APPLICATION:

The first transmission to use EC³ was a 1996 4T60-E FWD with a 3.4L DOHC engine. In 1997 it started showing up in some 4L60-E's. By 1998 it was in widespread use in 4T40-E, 4T60-E, 4T65-E and 4L60-E. (This may not help you to know if you have an EC³ unit but it may tell you if you don't.)

STICKER CODES:
(special thanks to DACCO)

4L60-E with 298mm converter

If the 3rd character in the code is an "N" or a "P" then it's WOVEN CARBON. If the 3rd character is a "G," "H," or "L" then it's a HIGH CARBON and is for use with un-blocked PWM units.

4L60-E with 300mm converter
(Removable bell)

If the 3rd character is a "B" then it's WOVEN CARBON. The jury is still out on "A" and "C."

4T60-E with the 245mm converter

The information on there is a little sketchier. Third character "F" or "P" appears to be consistently WOVEN CARBON. This applies also to the larger 4T65-E converters as in JTFM of JSFM.

TCC STRATEGY:

All Models

If the vehicle is still in driveable condition, then before you take it apart, drive it with your scanner attached and watch the TCC data. If it is EC³ the TCC will be enabled in second gear. The TCC slip should be at around 60 rpm or less, until you hit 55mph (where it will go to near zero). The slip numbers may not jive, however, because the transmission

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is, after all, in your shop for repairs. So just keep an eye on that TCC enabled data.

RESISTANCE TEST:

4L60-E, 298mm ONLY

Both the woven carbon and high carbon linings conduct electricity. If you carefully center the internals of the converter so the turbine or damper assembly is not touching the sides, you can measure the resistance between the outer shell of the converter through the lining to the turbine splines. The resistance of a woven lining will measure about 1.5 to 2 ohms. A high carbon lining will come in around 6.5 to 7 ohms. Paper lining will show infinity, and a reading of zero means you don't have the guts centered. This is a very tricky method to accomplish successfully, and it won't work at all on the 300mm or 245mm units because of internal design concerns.

CUT IT OPEN:

All Models

This is obviously by far the most accurate method of determining which lining you have. It still may not tell you which lining you need if it is not the original converter. You must also have ready access to your converter rebuilder and allow enough time for them to cut open your unit and supply an appropriate exchange. You will find the converter companies prepared for this service, but make sure to call first and find out their procedures and remember to send out the converter as soon as you get it out of the car to save time.

TCC REGULATOR VALVE:

"VIRGIN" 4L60-E ONLY

The TCC regulator apply valve on the EC³ units has an annular groove on the land closest to the spring *(see Figure 1)*.

This method does not apply to GM remanufactured "SERV" valve bodies *(see Figure 2)*. Note also that the "SERV" valve bodies are having problems due to cross leaks where they oversized the TCC regulator valve lineup.

If the valve body has been updated or repaired with a Sonnax kit, the valves will also appear different. Refer to *Figure 3* to identify these units.

PARTING NOTES:

New and better information regarding transmission and converter codes is coming all the time. The aftermarket is also working on developing and testing new clutch materials that will be compatible with EC³. If you have anything to add to this article that might help the industry cope with this new system and would like to share it, please feel free to e-mail me at concentric@transdoctor.com.

OEM 98-PWM (EC3)
Woven carbon converter lining. TCC slip control after 1-2 shift. Identified with scanner and active duty %

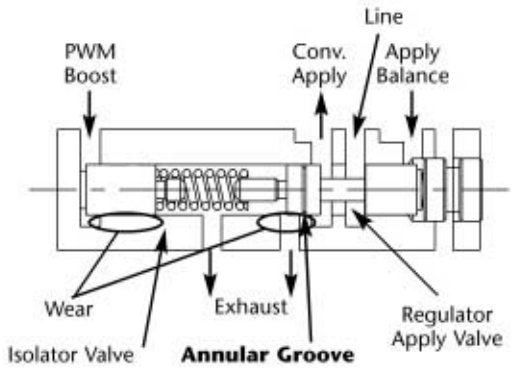


Figure 1 - Part 1

OEM 93- 97 PWM
2 Solenoids at front of body & 13 Pin case connector, scanner control slip after 2-3 shift

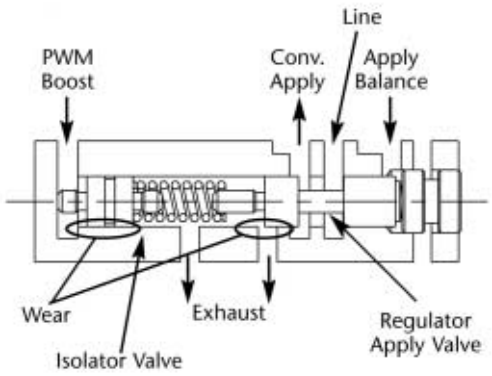


Figure 1 - Part 2

OEM 91- 94 NON-PWM
1 Solenoid at front of body & 12 Pin case connector

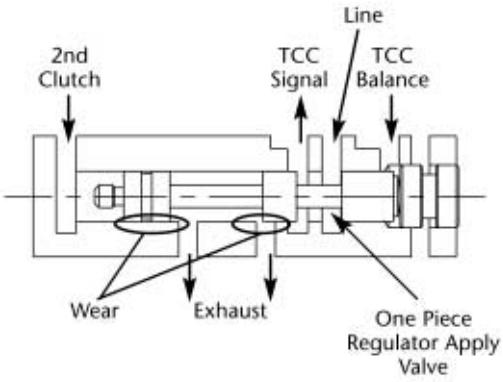


Figure 1 - Part 3

GM REMANUFACTURED SERV VALVE BODY

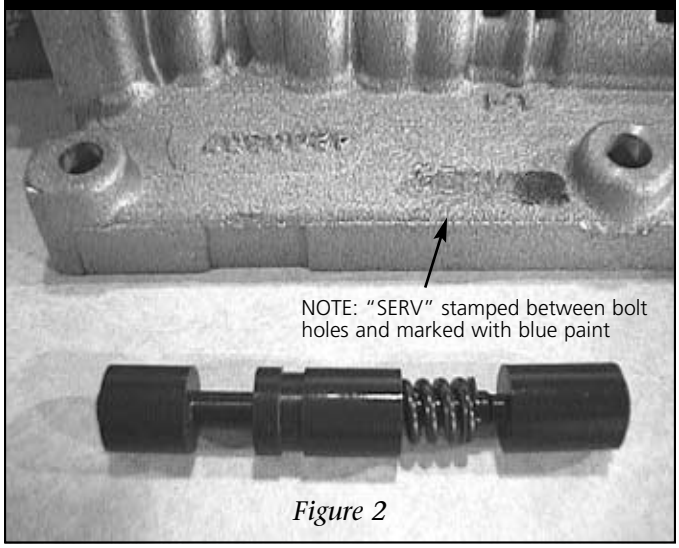
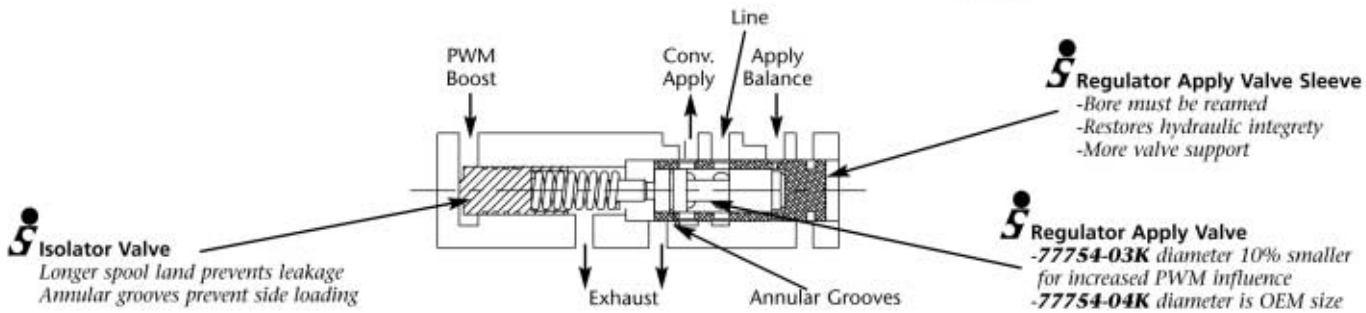


Figure 2

SONNAX 77754-03K 93- 97 PWM non EC³, results in higher apply PSI
SONNAX 77754-04K 98-UP KIT PWM, suggested for EC³ can be used to restore OEM apply PSI to all PWM designs



***Note:** Refer to **77805-K** & **77805E-K** for other TCC overheat, slip conditions.*

Figure 3 - Part 1

SONNAX 77754-03K INTALLED-NON PWM
Isolator valve installs with no spring

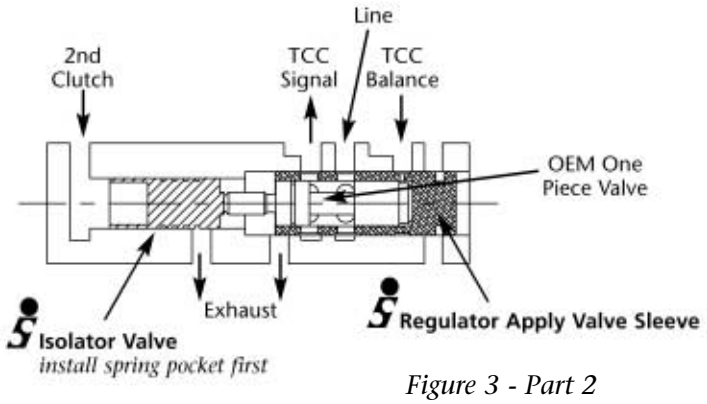


Figure 3 - Part 2