# BTR Trans Wiring Modification for Firmer Shifts

**EL1XR8, 9psi EB, and any other contributor will under no circumstances be held liable for any losses or damage caused directly or indirectly by performing the modification. By performing this modification, you will be responsible for any damage caused to any part of the Vehicle, Transmission, Wiring or ECU.**
**This information is for reference only, any changes made to the basic circuit can have unpredictable results.**

**If you don't understand any part of this document, DO NOT perform the modification.**

**Pre made modules are available from 9psi EB if required. (send an email / PM)**

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The S5 solenoid controls the friction element shifting pressures, and also the engagement pressure of the lock up torque converter. There are 2 other solenoids which control where the pressure regulated by S5 is actually supplied to, these all being controlled by the TCM. There is no internal measurement of shift pressures, as there are purely regulated by the current supplied to the S5 solenoid. The more current supplied to S5, the more the shift pressure is reduced, and the softer the shift is. So if we can reduce the current supplied to the S5 solenoid, then we can increase the shifting pressures.

Once a shift is initiated, the clutch regulator valve and band regulator valve are actuated, allowing the regulated pressure to be supplied for shifting to occur. At the same time the regulated pressure is reduced to a ramp start pressure, which varies depending on transmission temperature, gear, road speed etc. The pressure is then ramped to give the required shift feel.

As mentioned the S5 solenoid works by having maximum output pressure when the minimum current is applied to it (0.2A), and minimum output pressure when the maximum current is supplied to it (1.275A). On standby (i.e. when no gear change is occurring) the current is at 0.2A. By reducing the current supplied to the S5 solenoid, we can increase the pressure that the shift ramp begins at, and then consequently speed up the gear change. This is essentially what is achieved by replacing the S5 solenoid with a non-standard item.

We can easily reduce the current supplied to the S5 solenoid by fitting a resistor in series with it, but as there is a feed-back circuit on the S5 output, in which the TCM measures the return current, we must then 'trick' the TCM into thinking that the same current has been supplied as previous, and we do this with another resistor, this time in parallel with the other one and the solenoid.

These resistors do not affect the standby solenoid output pressure, as they just reduce the current available, and as the valve is in its maximum pressure location at minimum current this is unaffected.

On EB – ED MPFI I6's, The S5 Wire to the ECU is on pin 38, and +12v on pin 57.
On EF I6's the S5 wire to the ECU is on Pin 81, and +12v on pin 71.
On EA I6 – and all V8's the S5 wire to the TCM is on pin 7, and +12v on pin 29.

You need to cut the S5 wire around 10cm from the ECU / TCM plug.
This is the ONLY wire you need to cut. You only TAP INTO the +12v wire.

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The following information applies to EA – EB – ED and all V8 models.
(Does not apply for EF / EL I6)

> *While not knowing the exact characteristics of the S5 solenoid, based on the resistive load of S5 coil (3.5 – 5.5 Ω), and the typical current ramps (0.6 – 0.9 A) it was possible to estimate a 1Ω resistor in series would vary the ramped current by about 0.1 – 0.2 A, enough to hopefully produce a noticeable change in the gear-shift. If was then a simple matter to calculate the required parallel resistance required to ensure the effective resistive load would result in the same current flow by the TCM, which ended up being around 20 Ω, depending on the actual resistance of the S5 coil.*
> ***Due to the currents in these circuits, the resistors should have a power rating of at least 10W.***
>
> *The 20ohm resistor may get very slightly warm during use. This is NOT a problem.*
>
> *Using the repair manual, on the V8's, it was possible to determine which wire from the TCM was the supply for S5, and which was the (monitored feedback) return wire. After locating these, and installing 'quick-connect' connectors, then measuring the actual resistance of the coil circuit, and found it to be 4.5Ω. This worked out well with the estimated 20Ω from the calculations, giving an effective resistive load of 4.3Ω once the 1Ω resistor was in series, and the 20Ω was in parallel. This value was well within the specifications, so I predicted no start-up problems. If there were any problems it would be immediately obvious upon start-up, because if the TCM detects any parameters out of specifications, it puts the transmission in a 'limp-home' mode, in which third and reverse are the only gears available.*

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Due to design differences in the EF / EL ECU's the only changes requires are different resistor values, therefore ensure you use the correct schematic for your model.

All resistors should be rated a minimum of 10 Watts.

All connections should be soldered or created in such a way that there is no possibility of poor connectivity.

All wire used should be able to withstand a 5 Amp load.

The resistors should be housed in a suitable enclosure.
Plastic 'Project Boxes' from Electronic Retailers are suitable.

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The results of this were very noticeable and worthwhile. The shifts are now much quicker and firmer, but probably in the verge of being too harsh. I should add that I don't think that you would want to have them much firmer, as it may result in some driveline components failing if the shift is too harsh. It would also be advisable to install a 'tailshaft loop' to stop the tailshaft from hitting the road in the case of a damaged universal joint.

With the new firmness of the shift, you had to be real careful in the wet, as the car would wheel-spin very easily at part throttle. To make it a bit safer for other people to drive, I modified the circuit, so that it was possible to select either 'normal' and 'firm' shifts via a switch.