

Second Gear Please...

by Troy Morris

Manual AW4

NOTE 1: The modifications performed in this article are performed at your own risk. The author of this article or anyone related to this article cannot be held responsible for any damage or personal injury that may be incurred by performing by these modifications.

NOTE 2: This article allows for two modifications to be made that will allow your AW4 to function like a 5 speed transmission. The first phase address' the XJ's 1-2 gear selection. The second phase address' performing modifications to lock the torque converter. My recommendation would be to not perform the torque converter lock mod with out performing phase 1 first.

NOTE 3: WARNING: Only perform this modification on 1996 and older Jeep Cherokees. 1997 and newer Cherokee have a different computer and will not accept this modifications.

NOTE 4: A popular mod that some folks have done is to wire a switch to unlock the torque converter during full throttle to increase your engine RPM speed. I have not done this mod an do not cover it as it has the potential to overheat the transmission.

PHASE 1: Second Gear Please..

Most of us are tired of the Cherokee's 1-2 combination in the transmission.

Well, I thought that there had to be an easier way. All you need is 60 minutes of time and \$5 of parts.

Transmission School:

The automatic transmission uses two solenoid actuated valves to control several fluid valves in the transmission. The setting of the two solenoid valves determines what gear your transmission will be in. Example:

	Solenoid 1 Activated	Solenoid 2 Activated
	-----	-----
1st gear	Yes	No
2nd gear	Yes	Yes
3rd gear	No	Yes
and so on		

These solenoids are controlled by a small computer that receives input from the throttle position sensor and the shifter linkage. This computer is called the Transmission Control Unit or TCU and is located beneath the glove box on the passenger side. The TCU can be accessed by removing the lower half of the Dash trim.

Out of the TCU are two power leads that control the solenoids, one for Solenoid 1 and one for solenoid 2. By wiring a switch to these connections you can by pass the computer and at the flick of a switch have instant 2nd gear in the 1-2 position at the cost of \$5 or less.

Here is what you need:

- 1 toggle switch mounted at a place of convenience for you.
- 2 wire splices
- about 8 feet of 16-18 gauge wire
- 2 female style blade connectors for the toggle switch.
- 1 Diode

Here's what you do:

1. Remove the lower portion of the passenger side dash. The TCU and harness will be behind the plastic dash section on a metal bracket.
2. Disconnect the wiring harness from the TCU. (There are two rows of pins on the connector. Each row has 16 pins and are labeled D and C respectively)
3. Locate Yellow wire on D16. Splice into this wire (Leave about 5 inches between the TCU connector and your splice.) and run one length of wire to the mounting position and connect to the toggle switch. This yellow wire is the power and is hot when the ignition is on.
4. Locate the Violet wire on C15. Splice into this wire and run one length of the wire to the mounting position and connect to the toggle switch. When this violet wire has a 12 volt connection it activates Solenoid 2. (It is advised you wire a diode into the C15 line between the splice and the TCU. Diodes only allow current and voltage to flow one way. By doing this you prevent unwanted voltage from flowing back into the TCU. The diode will need be wired so voltage can flow out of the TCU harness but not into back into it. You can pick up a diode at any Radio Shack store for a few pennies)
5. Re-connect wiring harness and clean up. However, if you plan to do phase 2 leave everything disconnected as you will be doing additional wiring.

Summary of what you did or what you are about to do =

We are bypassing the TCU unit and controlling the 1-2 transmission section with a toggle switch. At a flick of the switch to the on position 12 volts is fed from the ignition input of the TCU to the Solenoid 2 lead. There is already a positive charge on solenoid 1 lead and the results are Solenoid 1 and 2 are on activating the proper valving in the transmission and the net result is Second Gear. At another flick of the switch you are back to normal operation. When you are done the completed wiring will should look like the diagram below.



click the picture to enlarge

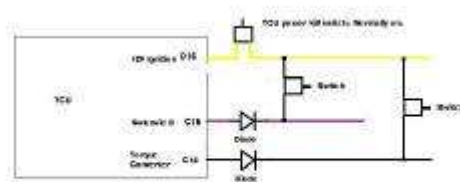
PHASE 2: Locking the Torque Converter

The phase 1 mod allowed you to control your 1-2 gear position, however, since we are dealing with an automatic transmission we are not direct drive like a 5-speed. The torque converter is essentially an automatic clutch. The TCU controls the torque converter and decides when to lock it and un-lock it. For example sitting at a stop light the clutch is not engaged allowing you to stay stationary. However, when you are at full acceleration the TCU applies power to a solenoid for the torque converter to allow it to lock and allowing you to get full engine power to the drive train. When 4 wheeling in 4 lo and you are going down a hill you may still have to ride the brakes a lot even though you are in 4 LO 1st gear. The reason for this is the torque converter is allowing some slippage so you do not have a true 1-1 compression braking with the engine. To help slow down the vehicle you can wire a switch as we did above to the torque converter lead and lock the torque converter. When this is done the vehicle really does act like a 5 speed. If the converter is locked and you are in say 3 rd gear, the engine will stumble and try to stall just as if it were a 5 speed trying to start in 3 rd gear. By having the ability to lock the torque converter you can more accurately control you down hill descents and keep your brakes cool. In order for this mod to work properly I designed it to allow you to kill power to the TCU. When the TCU has no power you will literally have a manual transmission controlled by switches.

To do this you will need to the following:

- 2 Single pole switches
- 1 diode
- 4 blade style, female connectors,
- wire
- tape
- 2 wire splice

1. Follow the steps above to get access to the TCU harness. Ensure the harness is disconnected and the ignition is off.
2. Locate the ignition wire D16. Attach wire splice next to wire splice for 1-2 gear mod. Leave about 5 inches between the splices and the TCU. Run length of wire from the splice to one side of the a switch.
3. Take the other side of that switch to C14 (white wire with black tracer). Wire a diode between the splice and the TCU the same as you did above to prevent unwanted voltage and current from getting to the TCU.
4. Now cut the D16 Yellow wire in the middle of the 5 or so inches you left between the splices and the harness connector. Strip each end of the cut about an inch and wire the remaining switch in-line of D16. Make sure you have the switch located in a desirable location before wiring it. You may have to use additional wire to run the length to your newly mounted switch.
5. Clean up and put everything back together. When you are done the completed wiring should look like the diagram below.



click the picture to enlarge

Operation: Normal operation. The switch that was wired in step 4 above will always need to be **on** for normal operation of the TCU. Turning it off will kill power to the TCU. It is my recommendation you turn the ignition off before flipping this switch to either the on or off position to avoid any voltage spikes.

When Wheeling – Flip the power switch to the TCU to off. All power to the TCU will be killed. Your tranny will literally be a manual. When in 3rd gear, you will be in 3rd gear, the TCU will have no power so it will not tell it to go to 1st for taking off etc. move the gear selector to 1-2 for first gear, flip you newly added switch for the gear control to access 2nd gear, move the gear selector to 3rd for 3rd gear, etc. If you desire to obtain true drive train lock for long descents then flip the switch wired in to the torque converter. This will lock the torque converter giving true 1-1 engine compression to drive train ratios.

I hope this helps and if you need further assistance feel free to email me.

Troy Morris