

Tuning

The TCU normally comes with standard gear profiles loaded. These profiles are just startup profiles to test the unit. Transmission setup differs too much to make standard maps for it due to the many variables like engine power specifications, final drive ratios, wheel sizes, fuel type and application requirements. In most cases you will have to tweak maps or start over with a fresh tune.

This section will guide you to setup different scenarios for your application like Automatic, Racing, Towing, Snow, Sand, Mud Low Range and Manual to name a few.

Each transmission comes with a Tyre Calculator to assist you in setting up the correct speed and RPM values. You will have to enter parameters like:

Engine Max RPM

Engine Idle RPM

Final Drive or Diff Ratio

Torque Converter Stall Speed

Wheel Size like eg. 255 / 55 / 17

These values can then be entered in the software map.

Always start with Profile 1 in automatic mode as this is the profile in which you have to calibrate all the sensors, so that it is the same for the other profiles. Any calibration in other profiles is not available. Calibrations are not changed by loading maps. They have to be adjusted in real time on the TCU. (See ***Cloning*** in the manual to preload calibrations.)

Note. The buttons have built in denounce features. If you press them too fast they will not respond. If you press them during the Shift Time cycle they will also be ignored. If you press them too long, then you may activate map change if the 2 buttons are selected. So give the TCU ample time to complete each action before you press them again.

Automatic Mode

This is the normal mode for your vehicle where you will use it every day like town and open country driving. This mode is used with Tiptronic in Automatic selection. The buttons will merely tell the TCU which is the highest gear to use. It will down shift if it is permitted. If you selected Maximum gear to be 3 for example, then it will ride automatic up to third gear. Up and down shifts will commence as usual. This mode can also be slightly changed as a Towing mode where you require the engine to shift at higher RPM's and do downshifts quicker to keep the engine in the torque band. This will be called Towing Map and saved in another Map position. Usually map 2 because map 1 and map2 can be changed on the fly. Map 2 to 3 or 3 to 2 must be changed at stand still.

Another variation is Sport map where you also select gears at higher RPM's to make the engine more responsive. Very much like the Towing map.

Procedure of Tuning.

Use this guide if you don't know the final drive ratio or wheel sizes so that you can use the Tyre calculator. (Wheel sizes is written on the sidewalls like 225/55/17)

Standing Still

1. First go through the setup and enter all the relevant settings that you do know.
2. Calibrate the TPS sensor.
3. Start the engine and check the rev counter calibration is correct, then save the data and switch the engine off.
4. Switch the ignition on and do the following settings while you are standing still.
5. Start with the following option settings.

The screenshot shows a software interface with several configuration panels:

- Active Sensors:** Includes checkboxes for RPM, Battery, TPS, and Speed, all of which are checked. Below these are icons for TPS and Speed. There is also an "Oil Temperature Sensor" dropdown menu set to "None", and four unchecked checkboxes: "Low Range Switch", "Overdrive Switch", "Second Gear Start", and "4 Wheel Drive".
- Tiptronic Options:** Contains a "Tiptronic" dropdown menu set to "Automatic".
- Shifter Sensor:** Contains a "Shifter Sensor" dropdown menu set to "POT Input" and a small graph icon.
- Map Selection:** Contains a "Map Selection" dropdown menu set to "1 MAP" and a small graph icon.
- Shift Base Algorithm:** Contains a "Shift Base Algorithm" dropdown menu set to "RPM".

Set the **Gear-Down Speed** to zero and the **Kick-Down Speed** to 200 for all the gear profiles as below.

Gear	2	<input type="checkbox"/> Lockup (TCC)	Gear Shift Time	2.5	(sec)
Gear down speed	0	(Kph)	Kick Down Speed	200	(Kph)

Set the **Gear-Up Speed** for first gear to 100 as in the block below.

Gear	1	<input type="checkbox"/> Lockup (TCC)	Gear Shift Time	2.5	(sec)
Gear up speed	100	(Kph)			

This will disable the speed settings so that you can set the RPM settings first. It will not work for Tiptronic as you do need the required speed settings.

Top Dots

Then set the Up Shift (Blue Line) High Dot to 90% TPS value, and to the maximum RPM value allowed for that gear. Do this for each gear. Set Gear 1 a bit lower to compensate for the shift time of the transmission. If it is too high the engine will over-rev.

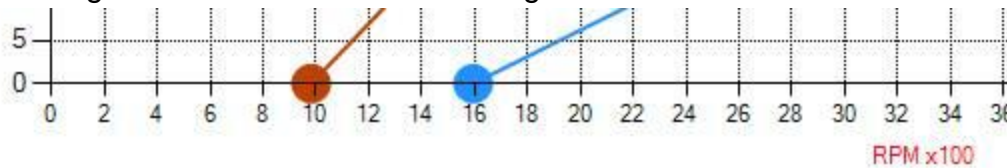
Now set the Down Shift (Red Line) High Dot to 90% TPS value and half of the maximum RPM value allowed for that gear. Do this for each gear. An example is, if you want a gear to reach 6000RPM under WOT, adjust the Down Shift High Dot to 3000RPM. This will be a safe value to start with, so that shift down does not over-rev the engine.



Bottom Dots

Set the Up Shift (Blue Line) Low Dot to idle RPM plus 800 RPM. An example is if idle RPM is 800, set this Dot to 1600RPM. Do this for each gear and add 100RPM to the next gear.

Now set the Down Shift (Red Line) Low Dot to idle RPM plus 200 RPM. An example is if idle RPM is 800, set this Dot to 1000RPM. Do this for each gear again adding 100RPM per gear. This will ensure that the gear does shift back when idling RPM is reached.

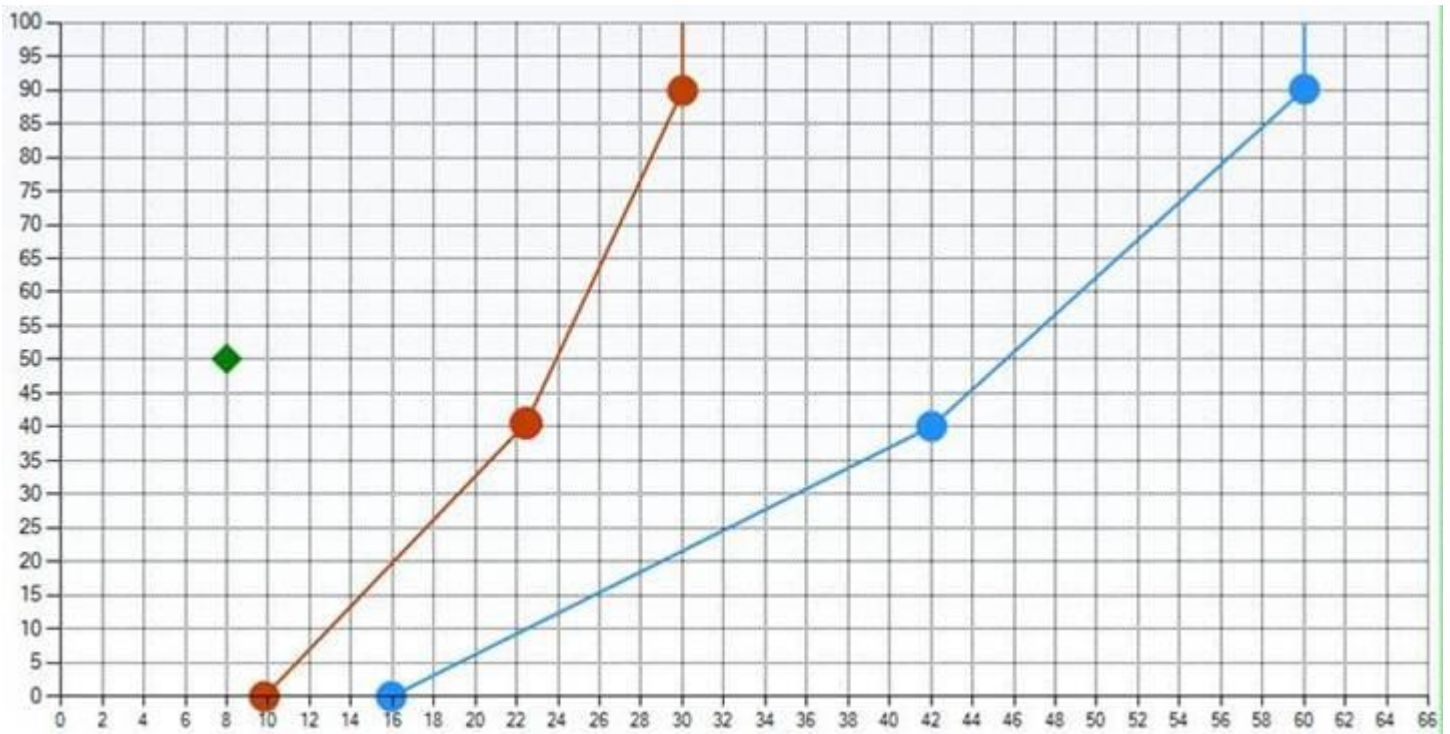


Middle Dots

Then set the Up Shift (Blue Line) Middle Dot to 40% TPS value, and set the RPM value slightly right from a straight line between the Low and High Dot. Do this for each gear.

Now set the Down Shift (Red Line) Middle Dot to 40% TPS value, and set the RPM value slightly right from a straight line between the Low and High Dot. Do this for each

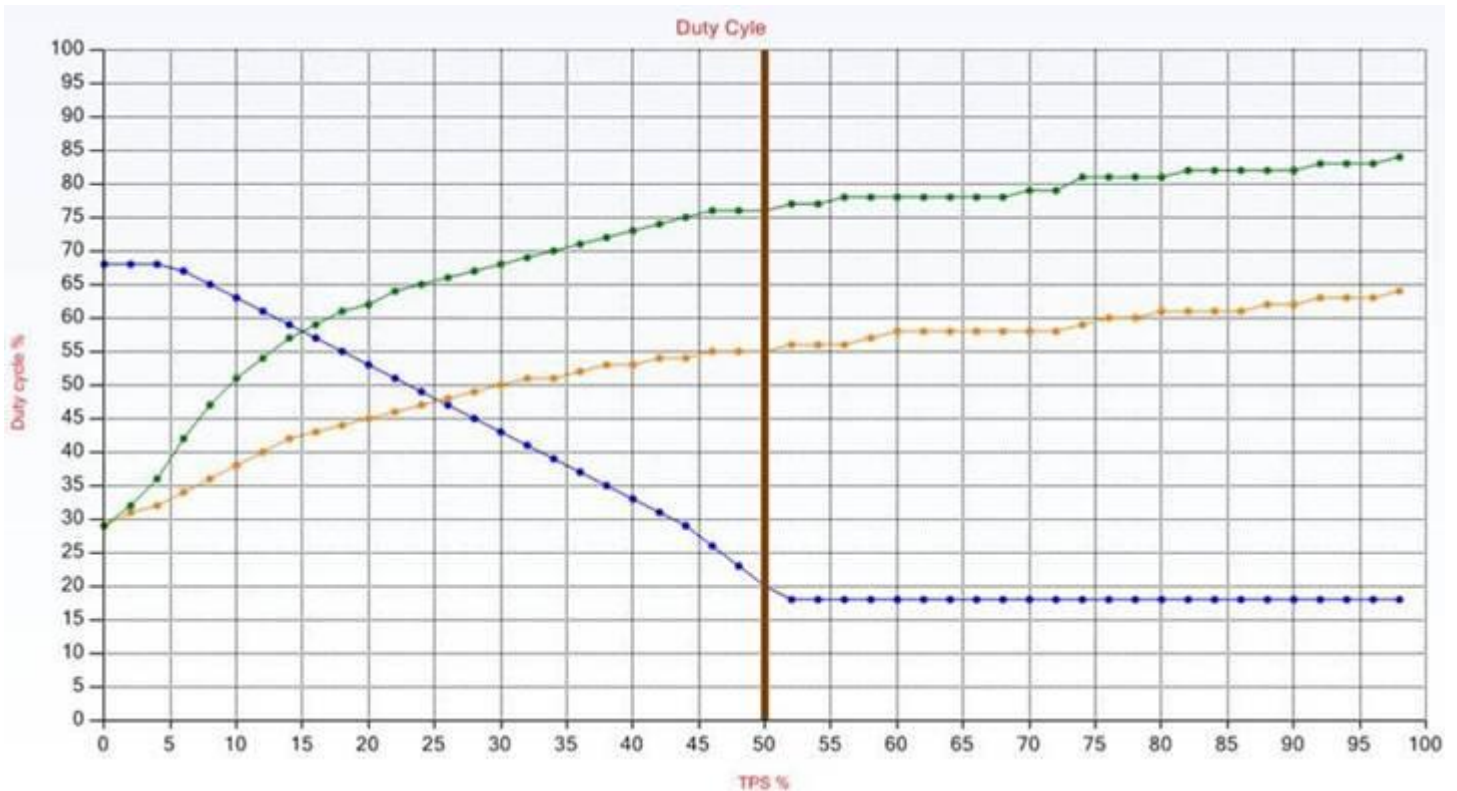
Preparation is now done and the gearbox should shift and make the vehicle drivable. Save this to the TCU.



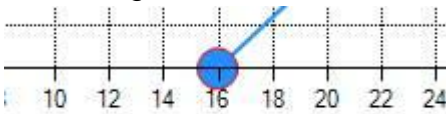
Driving and Basic Settings

Start the engine and pull off in drive. Find a quiet level road and calibrate the speedometer.

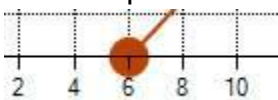
Should the transmission at any time feel like slipping, immediately back off the throttle and decrease the line pressure graph at that TPS setting. (It is the blue graph 1.) These clutches are small and will burn quickly and also burn the oil. If the transmission has more than one control solenoid, see the specific instructions on how to adjust the different graphs. Note, lowering the blue line pressure graph will increase line pressure that will result in a firmer shift. This may be transmission specific so make sure you have the special instructions document handy.



The first setting to adjust is light throttle pull off. Push the throttle to about 5 to 10 % TPS value and feel each gear when it shifts forward. This is an important setting if you crawl in traffic. If it shifts too quick to your liking, move the Up Shift (Blue Line) Low Dot more to the right and vice versa. Do this for each gear.



The next setting to adjust is low throttle gear down. For this setting we use the **Gear-Down Speed** setting. It is better to use actual road speed for gear down than RPM's. The reason is that torque converter's slip gives a false sense of drivetrain RPM's at low engine RPM's. This is due to the stall speed of the torque converter. There is also a difference in RPM when the Torque Converter Clutch is engage or not. Another reason is lower gears sometimes have free-wheel clutches which means the engine will idle at high speeds. First you need to set the Down Shift (Red Line) Low Dot to idle RPM minus 200 RPM. An example is if idle RPM is 800, set this Dot to 600RPM. Do this for each gear. This will prevent the TCU to gear down by engine RPM's.



Enter a value for the **Gear Down Speed** settings for all the gears except Gear 1. Leave it at 100 Km/h. Use a value which you think it should gear down. Start with a lower value to prevent lockup of the wheels.

Gear	<input type="text" value="3"/>	<input type="checkbox"/> Lockup (TCC)	Gear Shift Time	<input type="text" value="2.5"/>	(sec)
Gear down speed	<input type="text" value="25"/>	(Kph)	Kick Down Speed	<input type="text" value="0"/>	(Kph)

Now accelerate to top gear and release the throttle. Now feel each gear when it shifts back. If it shifts back harsh or too quickly, decrease the value and vice versa. Do this for each gear.

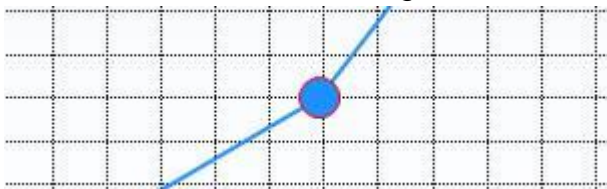
The **Gear-Up Speed** setting in Gear 1 is used as a forward shift speed to second gear. This is handy when the vehicle starts rolling on a downhill where the driver does not touch the throttle. When the vehicle exceeds this speed, the TCU will automatically shift to second gear. This speed must be higher than the second gear, **Gear-Down Speed** setting, otherwise the transmission will hunt between the gears. On some transmissions this setting is important as 1st and 2nd gear has a free running clutch and no engine brake, which means that RPM stay at idle regardless of the speed of the vehicle. Start with a value of 10km/h and make gear 2 Gear down speed 8.

Gear	<input type="text" value="1"/>	<input type="checkbox"/> Lockup (TCC)	Gear Shift Time	<input type="text" value="2.5"/>	(sec)
Gear up speed	<input type="text" value="10"/>				(Kph)

Gear	<input type="text" value="2"/>	<input type="checkbox"/> Lockup (TCC)	Gear Shift Time	<input type="text" value="2.5"/>	(sec)
Gear down speed	<input type="text" value="8"/>		Kick Down Speed	<input type="text" value="200"/>	(Kph)

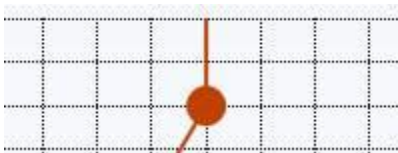
Middle Blue Dots

To set the Up Shift (Blue Line) Middle Dot, press the throttle in about 40% TPS value. Again, feel each shift if it takes place at the right RPM's. If it shifts too quickly move the Dot more to the right and vice versa. Do this for each gear.



Top Red Dots

Now to set the Down Shift (Red Line) High Dot RPM value, you need to cruise in the gears higher than gear 1, and at an RPM just lower than this Dot value. Then kick the throttle in quickly to reach a value higher than 90% TPS value. When the TCU shifts the previous gear, feel if the RPM in this gear is too high or too low. Adjust the Dot only left or right. This kick back should occur at a RPM where the lower gear still has range to improve the vehicle speed, without over-revving the engine. It should not be too low so that the engine labors in higher gear and not be able to gear down under high load conditions. Do this for each gear.



Middle Red Dots

To set the Down Shift (Red Line) Middle Dot for gear down when Throttle is pressed is a bit trickier. You'll need to cruise in each gear at low RPM. Then press the throttle in at certain depths and feel as gear down occurs at the correct acceleration. Adjust this Dot left and right till kickback occurs at the correct throttle opening.



Kick Down Speed

The last shift setting to adjust is the **Kick-Down Speed** setting. This setting lets the TCU gear down regardless of the RPM or if the **Gear Shift Time** has lapsed. It will also let the TCU shift back 2 gears at once. The TCU will gear down when the speed is below this value and the throttle is pressed to a TPS value greater than the Down Shift (Red Line) High Dot TPS value. This is set at 90% TPS. To start with a reasonable value, use 50% of the maximum speed for the lower gear. Example: If Gear 2 can reach a speed of 100 Km/h, use 50Km/h as a setting for Gear 3. This will leave ample room for the lower gear to accelerate the vehicle. If you found that the engine revs in the lower gear is too low, increase this value. Do this for all the gears except Gear 1.

Kick down speed: 90 (kph)

Gear Shift Time is important to let the transmission complete its hydraulic action before the TCU attempts its next shift. A setting here is normally 2.5 to 3 seconds. If the time is too short the TCU will do calculations for the next gear while the transmission has not yet engaged that gear. This will result in the transmission skipping gears and the engine revs falling too low. It will then kickback and start an erratic shift process. Rather start with a larger value and decrease till you detect inadequate operation. Then increase the time slightly. Also note that during the shift time at full throttle the engine may over-rev. then decrease the blue top dot's RPM value.

Gear Shift Time: 2.5 (sec)

Now, drive around with the vehicle under normal city and highway conditions feeling the TCU operation. This will indicate where little adjustment may be required to get the shifting to perfection.

Save the profile in the TCU and also on the PC as **Profile 1 Automatic.Spitcu**.

Now, select Profile 2 and load the file **Profile 1 Automatic. Spitcu** from the PC into the TCU. Press **Connect** and save it to the flash in the TCU and then start editing from there.

Repeat the save process and go to the next profile. For low range you may need to start over as with Profile 1. This is due to the speed settings that will be different. If the tranny has a L/R switch, then wire it in or make yourself a L/R profile. Then use only that profile with low range.

Once you are familiar with tuning you may tune the middle and top dots also in the up and down dimension. This is mostly a feeling by yourself if the transmission does what you want it to do. Try to see what the marker does while driving and try to get the shift lines where the transmission feels smooth. ***Be careful while driving as you may get distracted and cause an accident.***

Semi Automatic Mode

This mode is used for 4x4 or racing where the driver controls the gears of the transmission manually but the TCU will still do safety protection against over revving. You can set it up so that the transmission to assist the driver in routine tasks like gearing back automatic so you pull off in the right gear. Or shift up when the engine limiter is reached. This is handy for drag racing. This mode is also handy to pull off in higher gears or keep it in that gear for Dyno's etc.

This mode is used with Tiptronic in Semi-Automatic selection. The buttons will shift gears up or down if it is in the set limits. Below are a few rules on how to set it up. If the TCU seems non responsive it is one of these settings that will keep it from responding.

Procedure of Tuning.

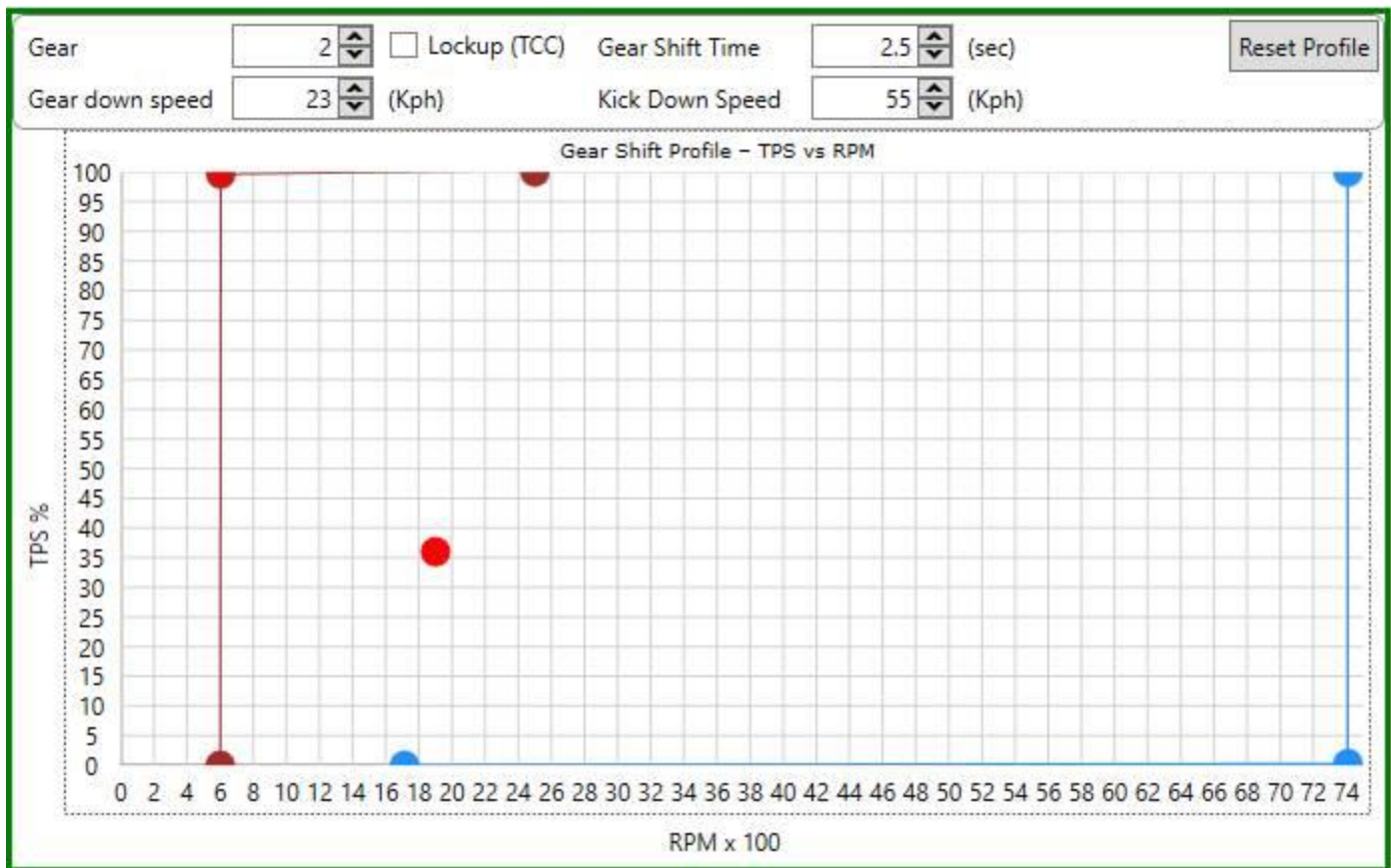
The next steps should have been done in your profile 1 automatic mode.

1. First go through the setup and enter all the relevant settings that you do know.
2. Calibrate the TPS sensor.
3. Start the engine and check the rev counter calibration is correct, then save the data and switch the engine off.
4. Switch the ignition on and do the following settings while you are standing still.
5. Start with the following option settings.

The image shows a screenshot of a vehicle tuning software interface with several configuration panels:

- Active Sensors:** Includes checkboxes for RPM, Battery, TPS, and Speed, all of which are checked. Below these are options for Oil Temperature Sensor (set to None), Low Range Switch, Overdrive Switch, Second Gear Start, and 4 Wheel Drive (which is highlighted with a dashed border).
- Tiptronic Options:** Contains a dropdown menu for Tiptronic, currently set to "Semi Automatic".
- Shifter Sensor:** Features a dropdown menu for Shifter Sensor, currently set to "POT Input", and a small graph icon.
- Map Selection:** Includes a dropdown menu for Map Selection, currently set to "4 MAP Switch", and a small graph icon.
- Shift Base Algorithm:** Contains a dropdown menu for Shift Base Algorithm, currently set to "RPM".

Set the profiles in a typical setup like below.



Notice how the graphs are drawn. All the dots are on the top or bottom. This means the marker cannot move above or below the horizontal lines and activate up or down shift. It can only move left or right of the vertical lines. You may have any variation you need but this one is popular for most control by the driver. Set each gear profile according to the following rules. Each scenario will be discussed.

Gear Shift Time

This time must be long enough to allow the manual transmission to complete the shift and the next gear to take up the drive train without slip.

Gear Shift Time (sec)

Slow Gear Down

Gear down speed (Kph)

This block will force a gear down if the speed falls below this value and the marker is left of the blue bottom left dot. In this example the blue revs are 1700 and the marker is 1900 so it will not gear down even if the speed is lower than 23 Kph. This will prevent gear down if the drive-wheels spin in mud for example. (Speed in this case must be taken from the non-drive wheels).

Preventing Automatic Down Shift

If you do not want the transmission to downshift automatically, move the vertical red line to below the Idle RPM's. In the example this line is on 600 RPM and the engine idles at 800 RPM. Also make the gear down speed 0 so that it will not activate down shift. Only way to down shift from here is with the buttons.

Preventing Automatic Up Shift

If you do not want the transmission to upshift when engine limiter is reached, then move the blue vertical line higher than the engine limiter. In the example this line at 7400 and the engine limiter is 7000 RPM max. So it will not go beyond the blue line and force an up shift.

Preventing Tiptronic Down Shifts

There are 2 limits that will prevent gear down with the tiptronic buttons. Vehicle Speed must be less than Kick down speed and the engine RPM must be less than the top right red dot. If revs are higher than 2500 in the example or speed are more than 55 Kph, then the downshift button is ignored.

Preventing Tiptronic Up Shifts

There are 2 limits that will prevent gear up with the tiptronic buttons. Vehicle Speed must be more than the next gear's Gear Down Speed otherwise that gear will force it back. The engine revs must be higher than the Blue bottom left dot. In this example it is 1700 rpm. If it is less, then the up shift button is ignored.

Manual Mode

This mode is used for complete manual selection of gears. The TCU can only be set up for protecting against accidental down shift at high RPM. This is handy for Dyno's etc.

This mode is used with Tiptronic in Manual selection. The buttons will shift gears up or down if it is in the set limits. Below are a few rules on how to set it up.

Procedure of Tuning.

The next steps should have been done in your profile 1 automatic mode.

1. First go through the setup and enter all the relevant settings that you do know.
2. Calibrate the TPS sensor.
3. Start the engine and check the rev counter calibration is correct, then save the data and switch the engine off.
4. Switch the ignition on and do the following settings while you are standing still.
5. Start with the following option settings.

Active Sensors

☒ RPM

☒ Battery

☒ TPS

☒ Speed

Oil Temperature Sensor

None

☐ Low Range Switch

☐ Overdrive Switch

☐ Second Gear Start

☐ 4 Wheel Drive

Tiptronic Options

Tiptronic

Semi Automatic

Shifter Sensor

POT Input

Map Selection

4 MAP Switch

Shift Base Algorithm

RPM

No need to set up profile lines. Only 3 settings are important.

Gear Shift Time

This time must be long enough to allow the manual transmission to complete the shift and the next gear to take up the drive train without slip.

Gear Shift Time (sec)

Kick Down Speed

Kick Down Speed (Kph)

No downshift will occur if the speed is higher than the Kick Down speed.



No downshift will occur if the RPM is higher than the Top red Dot.

Upshift will occur even at stand still.

Note that the engine must be running for shifts to occur.