

# How to Clean the M52TU MDK Throttle Body Potentiometers



### Disclaimer

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### How to Clean the M52TU MDK Throttle Body Potentiometers.

So, you are having MDK problems, have tested all the resistance of the potentiometers and want to give them a clean. Cleaning the potentiometers tends to increase their resistance. It may however, resolve a potentiometer that has stopped working correctly.

This “How TO” will guide you through taking the MDK apart and cleaning the potentiometers.

### Tools, Equipment and Supplies

The tools, equipment and supplies that you will need include:

- Several small screw drivers.
- Torx T10 screw driver bit and screw driver handle.
- Torx T27 screw driver bit.
- ¼” Socket and ratchet.
- 12-point ½” socket and ratchet.
- Pair of pliers.
- Pair of Vice Grip/Mole Grip pliers
- Hammer.
- ¼” drive torque wrench
- A large vice with soft jaws or suitable blocks of wood to hold the MDK without damaging it.
- Loctite 271, 263, JB Weld Perma-lock or similar maximum strength thread lock compound.
- Contact cleaner. Preferably, one with a contact lubricant included into the formula.
- Dielectric grease.

You may need replacement Security nuts. The thread is M8 x 1mm thread pitch. The original security nuts are 4.2mm high. When fitted, there is no visible thread above the nuts, so 4.2mm is the maximum grip the nut can apply.

If you can’t purchase suitable security nuts or nuts that allow for Staking, purchase normal nuts. These can be Machined/filed down to the correct height. Use maximum strength thread lock compound when fitting these nuts, so that they do not come off during operations of the MDK.

Nylock nuts are not suitable. Nylock nuts are too high for the Nylock to grip. Plus, the Nylock portion is 1.8mm high. If you machine/file down the nut to 4.2mm overall height, only 2.4mm of shaft thread will be gripped by the nut’s thread. This is insufficient.

### Dis-Assembly

Having removed the MDK, you want to take it apart and clean the Potentiometers. There is no guarantee that it will improve the MDK. It may make it worse.

So, which end do you start with?

Do not start with the cable cam end. Just because there is easy access to a nut, does not make it the right end to start with.

#### Tip

When you hit something delicate with a hammer, always consider which parts are going to resist the hammer's force, or you will damage something that you do not want to damage.

If you start at the cable cam end, the throttle plate/butterfly where it rests against the side of the throttle opening will be resisting the hammer's forces. Do you really want to damage this area and risk causing a mechanical fault in the future?

Start at the MDK motor end

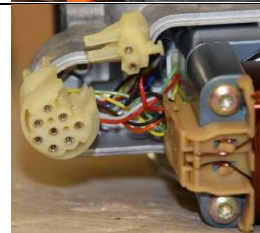
With Several small screw drivers, gently lift the black plastic cover over the metal tabs. Do this while pulling on the black cover. Work your way around the MDK. It will pop off eventually.



There is a connector on both sides of the cover. On the outside, there is the one for the car harness. On the inside, there is another one for the internal wiring.

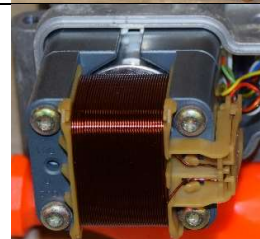


Gently pull the tab on the side of the inside connector to remove the motor section of the connector. It pulls out sideways.



The four M5 bolts that hold the motor windings on are very tight. A Torx 27 bit is required to undo them. A screw driver handle does not provide sufficient torque to undo the bolts.

Put the MDK into a Vice with soft jaws. Tap the T27 screw driver bit into the bolt head so that it has maximum grip. Use a 1/4" socket with a 1/4" drive ratchet to connect to the T27 bit. While pushing hard to hold the T27 into the bolt head, apply increasing force to undo the bolts. They undo with a pop.



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Removing the motor windings reveals the rotor. This is a very strong magnet in an aluminium housing. The housing is easily damaged. The security nut is recessed in the end of the rotor and has to be removed with a tool. The rotor has a slot and can only go on two ways. Note the dot indent next to the shaft. This shows you which of the two ways to fit it. There is a section of larger magnet on one side, hence the dot indicator. The dot is orientated to the end opposite to the inside connector.

Support the MDK in a vice with soft jaws, so that the cable cam end is sitting firmly on the bottom of the vice. The security nut at the cable cam end will resist the hammering.

With a suitable punch (a small screw driver works), gently tap open the stakes of the security nut. Do not do lots of damage to the nut as you are going to want to reuse it and re-stake it.

Once the stakes are open, tap a 12-point ½" socket over the security nut. This will grip the nut and you can easily remove it.



This is as far as you can go on this end. The black cap is a press fit onto the shaft. There is no keyway to ensure that you can fit it to the correct orientation or depth should you remove the cap.

There are sufficient openings to spray in contact cleaner and clean the throttle valve/butterfly potentiometers.

When spraying the potentiometer with contact cleaner, slowly rotate the throttle valve/butterfly but only through its normal angle of rotation. If you start to rotate the butterfly to greater than 90 degrees, the wipers in the potentiometers will move off their normal tracks. This will expose them to potential damage as they jump over the ends of adjacent carbon tracks.



Starting on the cable cam end. Support the MDK in a vice with soft jaws, so that the motor end shaft is sitting firmly on the bottom of the vice. The shaft will resist the hammering.

With a suitable punch (a small screw driver works), gently tap open the stakes of the security nut. Do not do lots of damage to the nut as you are going to want to reuse it and re-stake it.

Once the stakes are open, grip the edge of the nut with a pair of pliers, you can easily remove it.

Carefully remove the metal end-stop arm. Note that there is one spring either side of the arm.



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Undo the six T10 screw that hold the plastic cover to the throttle body.

Carefully work the cover up the shaft. You may need to feed some wire through from the other end to make it easier. The wires are in a clear plastic tube.

Once the cover has come over the end of the shaft, you will have access to the pedal potentiometers.

It is strongly recommended that this is as far as you go. There are sufficient openings to spray in contact cleaner and clean the pedal potentiometers.

When spraying the potentiometer with contact cleaner, slowly rotate the cable cam but only through its normal angle of rotation. If you start to rotate beyond its normal angles, the wiper in the potentiometers will move off their normal tracks. This will expose them to potential damage as they jump over the ends of adjacent carbon tracks.



Should you foolishly decide to continue to dis-assemble the pedal potentiometers, please note the following:

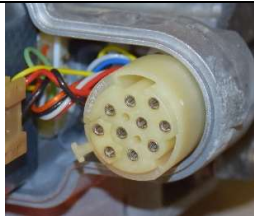
- The four melted caps are the only things holding the cover in place.
- The cover is made of a different plastic to the end cap. The cover is heat resistance and you can not melt it with a soldering iron.
- The end cap is made of PBT plastic. It is not compatible with any common plastics, so you can not use them as a filler rod when you go to remelt the caps and hold the cover on. Almost all plastics in the workshop were tried, without success.
- You will need great skill to push the melted caps up into a pile to remove the cover and still have enough PBT to try and reform the melted caps on reassembly.
- Mechanical fixing can be installed to hold the cover on. You will need to be using 1mm to 1.5mm diameter self-tapping screws and associated smaller drill bits to drill guide holes. Very fiddly and with no guarantees of success.
- The carbon tracks of the potentiometer are very easily damaged. Do not touch with fingers or multi-meter probes. The acid on your fingers will damage the tracks. The probes will leave sliver lines/tracks in the carbon tracks that will interfere with the operation of the potentiometer.
- The potentiometer wipers are very easily damaged. Do not touch with fingers. The acid on your fingers will damage them. They are easily bent out of alignment.

## Assembly

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <p>Starting at the cable cam end.<br/>Refit the cable cam end cap onto the shaft.</p> <p>Rotate the Cable cam clockwise so that the cam end-stop rests against the throttle body stop.</p> <p>Secure the end cap with the six T10 screws.</p> <p>Fit the metal end-stop arm. It fits between the two spring ends. The spring ends fit into recesses on the metal end-stop arm.</p>                                                                                                                                                                                                                                                                                                                                           |    |
| <p>Support the MDK in a vice with soft jaws, so that the motor end shaft is sitting firmly on the bottom of the vice.</p> <p>If the security nut is damaged, either replace it or apply a drop of maximum strength thread lock. Loctite 271, 263, JB Weld Perma-lock etc.</p> <p>Put the security nut on finger tight.</p> <p>Use a pair of pliers to grip the edge of the security nut to tighten the nut. The rotating force is being resisted by the end-stop arm hitting the throttle valve/butterfly 90-degree end stop.</p> <p>With a pair of Vice Grip/Mole Grip pilers, re-stake the security nut.</p>                                                                                                               |    |
| <p>This is a good time to check the resistance of the potentiometer at the inside connector. All end-stops are installed, so you can rotate the cable cam to the same places as before to get repeatable test results.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
| <p>Working on the motor end. Support the MDK in a vice with soft jaws, so that the cable cam end is sitting firmly on the bottom of the vice.</p> <p>Carefully inspect the rotor. Wipe/remove any metal filings/particle it has collected. These could interfere with the operation of the motor.</p> <p>Refit the rotor. Noting where to put the dot indent so that it is on the opposite end to the inside connector.</p> <p>If the security nut is damaged, either replace it or apply a drop of maximum strength thread lock. Loctite 271, 263, JB Weld Perma-lock etc.</p> <p>Put the security nut on finger tight.</p> <p>Tighten the security. The rotating force is being resisted by the fully closed end-stop.</p> |  |



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| <p>Carefully remove the ½" socket off the security nut.</p> <p>With a pair of Vice Grip/Mole Grip pliers, re-stake the security nut. As the security nut is recessed, you will need to use the corners of the pliers. Be careful not to damage the rotor.</p>                                                                                                                                                                                                                                                                                                                                                                               |                                                                                       |
| <p>Rotate the MDK in the vice as needed. Refit the motor winding with the four M5 bolts finger tight.</p> <p>Remember to tap the T27 bit into the bolt heads to get maximum grip. With a torque wrench tighten the bolts to 10 Nm.</p>                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| <p>Put the motor connector back into the inside connector.</p> <p>Correctly fit the inside connector into the MDK housing and check the wires are ready for the cover to go on.</p> <p>Give the inside connector a spray with contact cleaner. Also spray the connectors on both sides of the black cover.</p> <p>Once all connectors are dry, carefully apply a small amount of dielectric grease to each pin. Making sure that you do not bridge two pins with grease. A very small screw driver is helpful.</p> <p>Refit the black cover. Apply closing pressure on all side to ensure that the cover clips over all tabs correctly.</p> |    |
| <p>Do a final resistance check between all pins to confirm correct operation and record the final resistance readings.</p> <p>The MDK is ready for installation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |

## Resistance Tests

| DME<br>Pin | MDK<br>Pin | Wire<br>Colour | DME<br>Pin | MDK<br>Pin | Wire<br>Colour | Description                               | Closed Values   |  |  |  | Open Values     |  |  |  |
|------------|------------|----------------|------------|------------|----------------|-------------------------------------------|-----------------|--|--|--|-----------------|--|--|--|
|            |            |                |            |            |                |                                           | Expected        |  |  |  | Expected        |  |  |  |
| 4          | 1          | RT/GN          | 14         | 7          | BR             | Power Supply P1                           | 1030 to<br>1260 |  |  |  | 1030 to<br>1260 |  |  |  |
| 14         | 7          | BR             | 19         | 8          | SW             | Throttle Position P1<br>- Actual reading  | 1030 to<br>1260 |  |  |  | 1665 to<br>2035 |  |  |  |
| 14         | 7          | BR             | 16         | 6          | SW/VI          | Pedal Position P1<br>- Actual reading     | 1030 to<br>1260 |  |  |  | 1665 to<br>2035 |  |  |  |
| 7          | 2          | RT/GN/GE       | 20         | 4          | BR/WS          | Power Supply P2                           | 1030 to<br>1260 |  |  |  | 1030 to<br>1260 |  |  |  |
| 20         | 4          | BR/WS          | 10         | 5          | SW/GN          | Throttle Position P2<br>- Actual reading  | 1030 to<br>1260 |  |  |  | 1665 to<br>2035 |  |  |  |
| 20         | 4          | BR/WS          | 9          | 3          | SW/GE          | Pedal Position P2<br>- Actual reading     | 1030 to<br>1260 |  |  |  | 1665 to<br>2035 |  |  |  |
| 4          | 1          | RT/GN          | 19         | 8          | SW             | Throttle Position P1<br>- Reverse reading | 1665 to<br>2035 |  |  |  | 1030 to<br>1260 |  |  |  |
| 4          | 1          | RT/GN          | 16         | 6          | SW/VI          | Pedal Position P1<br>- Reverse reading    | 1665 to<br>2035 |  |  |  | 1030 to<br>1260 |  |  |  |
| 7          | 2          | RT/GN/GE       | 10         | 5          | SW/GN          | Throttle Position P2<br>- Reverse reading | 1665 to<br>2035 |  |  |  | 1030 to<br>1260 |  |  |  |
| 7          | 2          | RT/GN/GE       | 9          | 3          | SW/GE          | Pedal Position P2<br>- Reverse reading    | 1665 to<br>2035 |  |  |  | 1030 to<br>1260 |  |  |  |

### Notes

- 1) Expected data is based on a population of 1 new MDK +/- 10%
- 2) Look for out-of-range values or values out of line with the others
- 3) Look for higher resistances at the DME than at the MDK to indicate a high resistance connection.