

1992-1997 Subaru SVX TPS Investigation and Possible Homebrew Repair Procedure (ver 0.1 12/16)

Prepared by gwynethh and friends 2016

This document discusses our investigation of SVX and other Subaru Throttle Position Sensors with an eye out to working up a replacement for the SVX ones that are No Longer Available from Subaru.

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You can skip to the end of this document for the bottom line.

Part 1 Research

We started out by purchasing a dead SVX TPS from a Face book friend and two possible donor ones.

Used 93-97 SUBARU IMPREZA OEM Throttle Body TPS Position Sensor A71-611R02



THROTTLE POSITION SENSOR SERA483-06 TPS FITS SUBARU SUZUKI 22633-AA110 TH237



Initial investigation

1. The TPS info in the 1992 SVX service manual appears to be incorrect on the expected closed resistance of 10-12K Ω (but INCREASING as opened). Open resistance test of 5K Ω appears to be close.
2. The used SVX TPS we tested had a closed resistance of about 100 Ω and an open resistance of 5.8K Ω and a gap in the readings.
3. The used Impreza TPS has a closed resistance of 60 Ω and open resistance of 5.3K Ω . The Impreza TPS requires a different mating plug due to a lip inside the socket with no gap in the readings.
4. The new generic TPS had closed and open resistances that are way off.

Some photos of the disassembled SVX TPS and the schematic.

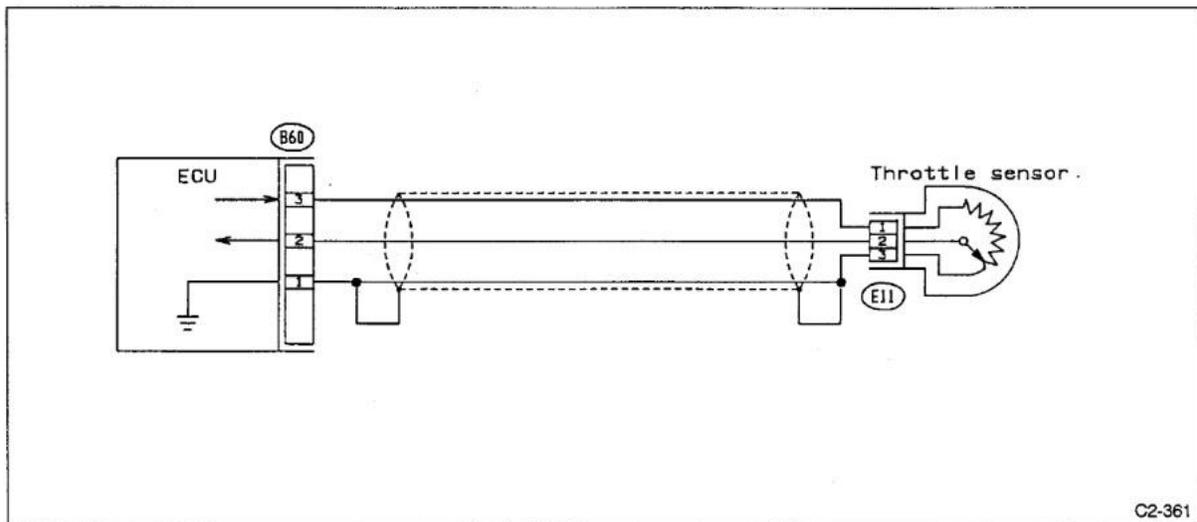


Fig. 82

and the FSM page on trouble shooting that appears to be total baloney with wrong resistances. We found 5.5K Ω on pins 1 to 3 and ~200 Ω between pin 2 and 1 (or 3 depending how you interpret the Subaru manual figure).

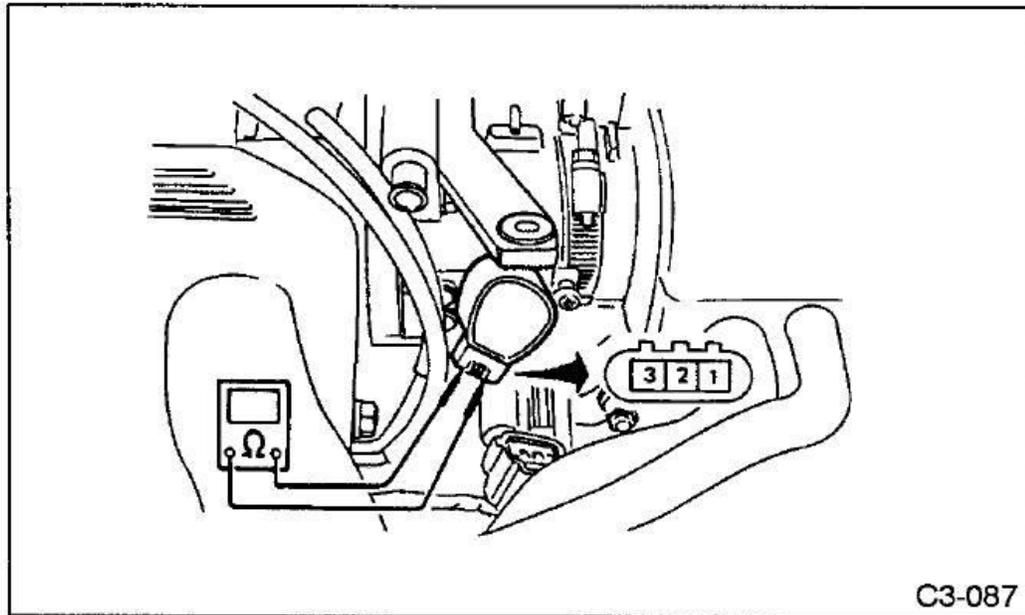


Fig. 83

4) Measure resistance between terminals while slowly opening throttle valve from the "close" position.

Terminal/Specified resistance

No. 2 — No. 3/10 — 12 k Ω [Fully close]

/3 — 5 k Ω [Fully open]

Ensure resistance increases in response to throttle valve opening.

We received some clarification from SVXer and former network member Trevor as quoted below

"I note that you regard that the TPS resistance values appearing in the manuals are baloney LOL. However I think you will find them correct after further thoughts if you take into account errors in the formatting, probably occurring as a result of multiple copying. Consider the two measurements as both taken from pin 1 i.e. ground and as follows. ---

Between 1 & 2 = approximately 10K ohms, throttle fully closed.

Between 1 & 3 = approximately 5K ohms, throttle fully open. (In fact in any position.)

It would appear that the TPS amounts to more than a simple voltage dividing potentiometer and both elements tracked by the contacts constitute resistances of approximately 5K ohms. The diagram shown in the manual will therefore represent a simplification of the actual device.

Both tracks are therefore involved in setting the signal delivered via pin 2 and both are in series between 2 & 3 thus providing the specified 10K ohms. While the output is voltage is increased via a voltage divider on opening the throttle, resistance applied in the output line is reduced and linearity modified accordingly. The TCU will probably utilize the signal within a closed loop rather than as a straight voltage.

If you take these factors into consideration you will be able to make logical sense of the setup and the resistance values quoted in the manuals.

I would presume that the two resistance tracks will be of conductive plastic rather than a layer of deposited carbon in view of the arduous and exacting duty involved. It has been years since I examined one and did not break it open as you have done. I can recall considerable head scratching when sorting out its exact operation.

As a matter of interest I attach a write up on the TPS which I posted some years ago. If I can assist further, come back to me. Your project is certainly worthwhile.

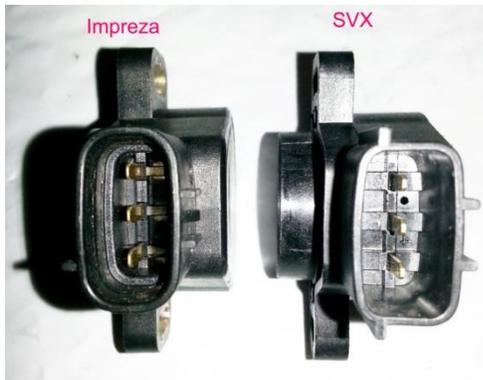
Regards, Trevor."

Thank Trevor. This could help many of us.

Images of the SVX TPS internals and some Impreza photos



Impreza TPS photos below





All parts. (Note the eyelet we broke on the bad SVX contact plate). The assembled view is of the Impreza TPS. On that TPS the spring hook is on the lower part of the retainer.

After doing the initial photos and resistance checks we opened the Impreza TPS by grinding out the sealing epoxy (?) between the back cover and body.

Photo of Impreza and SVX contact plates



The Impreza one appears to have wider contact traces as the SVX one. Sadly the Impreza TPS is NLA in the USA.

The cause of failure seems to be wear of the deposited carbon off of the contact plate.

[or as Trevor suggests "As I see it, faults could in the main be confined to contaminated contact surfaces and or reduced contact pressures. In many instances application of CRC or whatever, without opening up the unit could restore proper operation, as was the case in respect of my TPS. If this is in-effective and the unit is disassembled, provided that the contacts remain intact, slight bending should restore proper contact pressure. It should be possible to check the continuity of the substrates by running a meter probe around the contact surfaces."

We tried a generic Subaru one that looked plug end similar but the contact plate was very different and unusable. So no go on the 10\$ SERA483-06 TPS FITS SUBARU SUZUKI 22633-AA110 TH237. Internals were not photographed.



- On order is an A71-601 T00 from a Nissan 200SX Sentra 1.6L 1995-1997. www.ebay.com/itm/282200356041 and Nissan Infinity 226205E400/226206P005, A71-620 P00. They also look similar externally and have the same part no. prefix of A71 as of the SVX and Impreza one with the promising looking internals. A tentative hypothesis is that TPSii with part number prefixes of A71 will have the same internals. Waiting on delivery from China for the Sentra one and Idaho for the used Infinity one. Well the A71 hypothesis was a bust but we did find some SVX era TPSii that have compatible contact plates).

We opened a refurbished A71-000 B50 and it MAY have had a proper ceramic contact plate but we broke it getting it disassembled. If you try one of these, start by grinding off the swaged head holding the operator arm to the shaft. Pop off the arm and the return spring. After that, remove the back plate per the method above or just destructively. Carefully pull out the nylon (?) part holding the contact fingers. The ceramic plate then can be de-soldered. The contact plate in this TPS is upside down from the SVX one. The resistances on the pieces of the contact plate add up to about 5.5K ohms.



Also on tap is a possibility of buying the Impreza ones from China at 80\$ for 4 plus 20\$ s/h.

Ok no luck getting new Impreza ones but we did score some refurb SVX units from China!

Part 2 Procedure to replace the worn contact plate

If at all possible, do not use your existing SVX TPS because if you mess it up you are looking at a 350-450\$ expense to buy a non-OEM purported replacement: Beck Arnley 158-1385, Standard Motor Products Th305, and AC Delco 213-4113.

Tools needed: a Dremel or similar, cutting bits such as the below pointed bit and cutting wheels, some rubbing alcohol to clean the parts, some electrical contact cleaner, some Q-Tips and a maybe a can of compressed air used by techies for PC dust blowing. If you are really lucky and have one of those mini machine shop all in ones this work might be easier for you. Also a face mask 'cause who knows what is in that epoxy we'll be grinding out.

For reassembly some JB Weld or hot melt glue.



In any case practice operating on the TPS by first opening the new non SVX TPS as follows. This will be the hard way to get into the new TPS to practice the technique needed for the SVX.

Identify the sealing plastic/epoxy between the back cover and body of the new TPS. Shown in silver on the donor TPS.

Start by cutting the straight runs of the sealing epoxy in shallow depth cuts. If your toothed wheel is small enough you can try making some cuts in the curved portion. The cuts photo was made on the Nissan Infinity TPS we tested. Use the same method on the SVX



SPARE you plan to open.

Make several shallow passes and pry out the back. This is what you should see. The contact plate you need to save from the donor TPS is that white thing. It snaps in place and is held in position by the three soldered contacts. Remove most of the solder with solder wick or a solder sucker. Be careful as the eyelets of the contact plate are fragile. If you are opening a Sentra A71-000 B50 the plate will be below the nylon plug and upside down too boot.



After removal the contact plate should look like this.



The wipers should be looked at to see if the ones in the SVX body are usable or if you should also transplant the wiper rotor.

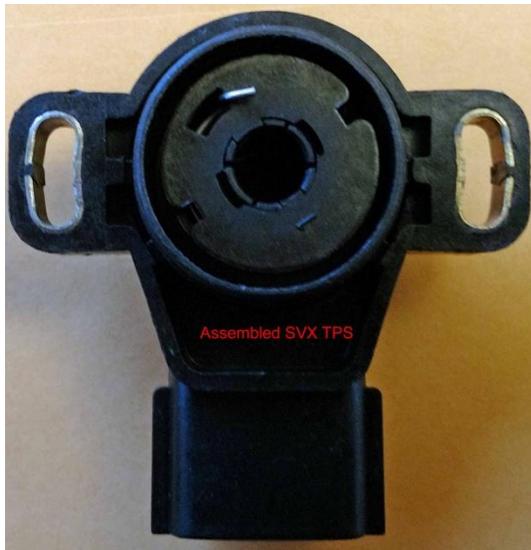
Under the contact plate you should see this. Note the contacts/wipers to the left and right of the center post/spindle.



The solder pins will look like this before clean up.



To reuse the spindle, unhook the spring from the front plate and pop the front plate off



Front plate and spring hook of a SVX TPS.

To reseal the TPS place the oring and back plate in position. Clamp the back plate down and re-glue/reseal the JB Weld or Hot gun glue. The JB Weld may be better in the hot engine compartment.



Both of these TPSii seemed to behave properly on the bench. The all SVX parts one (left) is from the Chinese refurb one we opened to investigate. The SVX body one was reassembled from a bad SVX one with an Impreza contact plate.

Part 3: Procedure to use the 93-97 Impreza "as is". UNTESTED!

If you can obtain the car side plug that mates to the 93-97 SUBARU IMPREZA OEM Throttle Body TPS Position Sensor A71-611R02 AND the TPS it MIGHT be easier to leave the new Impreza TPS alone. Swap the Impreza plug for the SVX one mating the same color wires. Then just plug the new Impreza TPS in. This will be easy, if it works. Let us know how you made out if you try this.

Part 4: The Bottom Line

1. Buy a new aftermarket TPS at ~370\$ for a Beck Arnley 158-1385, Standard Motor Products Th305, or an AC Delco 213-4113 if you can find one.
2. Use the 93-97 SUBARU IMPREZA OEM Throttle Body TPS Position Sensor A71-611 R02 and connector if you can find one.
3. Rebuild a SVX TPS using the contact plate from a SUBARU IMPREZA Sensor A71-611 R02 or a Nissan A71-000 B50. Our test rebuilds seemed to have the proper resistances and no drop outs.

4. Go to Alibaba and a Chinese supplier and try to find what appears to be a refurbished OEM SVX TPS A71-610-R50.

Adjustment procedure courtesy of Trevor:

"THROTTLE POSITION SENSOR

Adjusting Testing Cleaning

The TPS comprises a potentiometer, incorporating a conductive plastic element utilized in a voltage divider configuration. It is connected via three wires to a plug and socket close, alongside, so that it can be easily removed for servicing.

The connecting wires are configured:-

Black: Ground end of the resistance element.

Red: The opposite end of the element.

White: The moving wiping contact.

Adjustment

In order to adjust the TPS the Subaru Manual advises to measure the TPS voltage by inserting meter probes into the plug at the ECU plug connection. This makes it necessary to tie yourself in a knot under the dash. However the procedure can be conveniently carried out by making a connection to the wiring where it connects to the TPS. You will require, best of all one of those dressmaking pins with a nice thin shank and a knob on the end, or a thin needle. Also a meter with clip on leads, able to accurately measure 0.5 Volts DC.

Holding it with pliers, stick your pin or needle right through the white insulated wire to make good contact with the conductor and clip your positive meter lead onto it to take measurements. A fine pin will not damage the conductors as they will spread and there will be no significant damage to the insulation.

(If you remove the TPS for cleaning or are fitting a replacement, stick the pin in while the wire is easy to get at on the bench. Don't forget to pull out the pin when you are done.)

(1) Connect wiring connectors.

(2) Loosen TPS fixing screws.

(3) Turn ignition on.

(4) Set up the meter to measure voltage between the white wire and ground, i.e. by connecting negative to the engine, or battery negative.

(5) Make sure that the throttle valve remains fully closed. Adjust the position of the TPS by partly rotating the complete assembly, so that at the exact point where the throttle starts to open, 0,5 volts is indicated. Tighten the fixing screws. Recheck by again moving the throttle.

The voltage is specified in the manuals as being within a tolerance from 0.45V to 0.55V. You should have no trouble in setting things at exactly half a volt.

Testing and Cleaning

Before removing the TPS or altering the original setting it is a good idea to mark the mating castings with a scratch, so that the adjustment before and after settings can be confirmed. Remove the unit and work on a clean bench.

The resistance of the element end to end (black to red), should measure very close to 5,000 ohms. Tap the unit while measuring to detect possible intermittent connection or a crack in the element.

Measuring between white and red or white and black, should show a smooth change in resistance when moving the control shaft over full distance. Blips will indicate faulty contact and trouble.

The sensor incorporates a resistive plastic element arrangement and, even without dismantling, a spray with CRC or similar electrical cleaner worked into the interior can do wonders in restoring proper contact; a before and after check will indicate success.

Testing Without Removal

With the unit in place, and using a needle or pin as used for adjustment above, make a connection, and check on the output voltage as the mechanism is slowly operated while connected and energized, will also give an indication of possible intermittent contact. A smooth change in voltage should be recorded.

Note: An oscilloscope or a meter with a bar graph, will show up short duration moving contact faults, much more accurately than a normal instrument digital or analog, as both have an inherent time delay before there is an indication registered. Hence the need to move the TPS mechanism carefully and very slowly. This factor should be taken into account but should not deter those without sophisticated gear."

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