

PCU Replacement Procedure

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Overall notes:

It is preferable to perform the PCU replacement procedure on a lift, or to have access to under the car on a creeper, but it is not necessary.

Two keys are required for the Transponder Learn process. Without two unique immobilizer RFID chips, the PCU will not run. (The Transponder Learn routine is only required if a new VCU or PCU is installed. The same applies if a used VCU or PCU from a different car is installed. If the PCU is repaired and re-installed the Transponder Learn routine is not required.)

If a nut, bolt, washer, etc. is dropped, it is often caught by the front bumper; you can reach underneath and give it a shake and often times it will drop what was lost. (Update: I'm now zip-tying the bottom of the bumper to the radiator fan, so it doesn't shake nearly as well—but it doesn't get hooked on curb stones and break the bumper nearly as well either.) Another place that dropped parts like to hide is in the 12V battery bracket.

Never, ever plug in the low voltage connector to the heater without having the high voltage connector plugged in to a working high voltage port on the PCU. It will necessitate the VCU and CDCM being replaced until that mistake is not made again. If there is any doubt about connecting the PTC heater, do it with the 12V battery disconnected. When disconnecting the PTC heater, always disconnect low voltage first. When connecting the PTC heater, always connect low voltage last. With the PTC heater disconnected tie a rag around the low voltage connector to serve as a reminder that it should be the last thing to be connected.

In the cabin:

Record radio presets.

Release the hood.

Release the rear hatch.

Prepare the cargo area for storage of under-hood parts, removed as interference. (Put down blankets.)

Under car:

Disconnect 12V battery.

Remove the bolt that secure the 12V battery bracket to the frame—just forward and above the battery itself. This will allow the transverse frame to be pulled forward and give you enough room to pull the PCU out. (12mm or 13mm bolt)

Put hose pliers on both main coolant hoses connected to the PCU.

Position a drain pan and use hose clamp pliers to remove the hose going into the bottom of the PCU.

Under hood:

Remove the hood. (2 x 10mm bolts)

Remove the cabin air duct. (1 x Torx 25 screw)

Disconnect the windshield washer hose (lift out the fitting from the cowl and disconnect from the bottom side). Secure the hose (e.g. by tying around the PCU coolant vent hose)—otherwise it may be difficult to re-route or worse, could syphon out the entire washer bottle.

Remove the wiper arm. (2 x 13mm bolts)

Remove the wiper arm fitting. (17mm)

Remove the plastic cowl (secured by 5 body clips).

Disconnect the hood release cable and secure in such a way that it will be difficult to forget to reconnect it.

Remove the bracket that the attaches to the condenser/low side A/C line, transverse frame, and wiper motor/transmission. Remove the bushing from the condenser and install into the bracket—it's virtually impossible to re-install with the bushing on the condenser rather than vice versa. Tie rags around the aluminum A/C line mounting points to prevent your forearms getting scratched up later. (7 x 10mm bolts)

Disconnect the wiper motor connector. (During reassembly use a cable tie to secure the wiper motor wire harness away from the back side of the wiper motor assembly because it can chew up the wires and break the assembly.)

Remove the wiper motor/transmission. Try to not drop the nuts and washers—they can be very difficult to locate. (4 x 10mm nuts, deep socket)

Disconnect the vacuum pump connector.

Disconnect the vacuum pump hose clamp and hose.

Remove the vacuum pump. Be careful that the mounting springs aren't lost if they come loose. (3 x 8mm nuts, deep socket)

Remove the right headlight assembly. (Bolt with hand-knob and electrical connector)

Verify that the 12V battery is disconnected. Disconnect the 4 connectors along the top of the PCU and secure the wire harness out of the way (into the right headlight).

Detach the power steering pump bracket from the transverse frame (2 nuts on the fore side (13mm deep) and one on the aft side (10mm)). The pump will need to be moved around to access the PCU mounting bolts, and needs to be dropped down so the transverse frame can be pulled all the way forward when it comes time to actually remove the PCU from the car.

Disconnect the ground strap from the left (port) side of the PCU (15mm bolt), and note the position of any washers that are installed.

Disconnect the low voltage connector on the top of the motor.

Disconnect the high voltage lines at the motor:

This can be one of the most frustrating steps of this entire procedure. Cut the zip tie near the mid-point of the 3-phase cables that secures the cables to the motor; you may choose to pull the cables up. Use a mirror to locate the single bolt that secures the 3-cable connector to the motor; it is located just under the white jumper wire that is a part of the Emergency Power Off (EPO) circuit. Also note that just under the bolt is a plastic alignment pin that can easily be mistaken for a bolt head. Use a Torx30 on a short (about 2") extension; connect that to a ratchet through another extension (I use a 5") and universal joint. Make sure the Torx bit is well seated in the bolt head before attaching the ratchet. Work the connector loose as the bolt is loosened; the bolt is held into the connector by a tiny snap ring, so if the bolt is backed out the entire way with the connector fully seated to the motor, the snap ring will bind. Press the tab to fully release the connector. Make sure the snap ring isn't still inside the connector—it will make it impossible to re-install the bolt. I usually throw the snap ring away—I think it causes more trouble than its worth.

The 12V battery must have remained disconnected for at least 10 minutes prior to proceeding to ensure that the PCU capacitors are sufficiently discharged.

Remove the small front cover of the PCU (8 Torx25 bolts).

Disconnect the high voltage DC cables (Torx25 (although I have seen 4mm hex, too) for the shield from underneath, Torx45 for the main conductor (although I have seen 6mm hex, too). (It's easiest to leave the 3-phase cables connected to the PCU until it is pulled from the car.)

Remove the 8 bolts that mount the PCU to the vibration isolation brackets (13mm).

Remove the 4 bolts that secure the transverse frame to the strut towers (10mm). (It's good to have a gear wrench for the ones on the left (port) side.)

Remove the 4 bolts that secure the bottom of the transverse frame to the main vehicle frame (13mm, although I have seen 12mm, too). (It's helpful to have a universal joint on a long extension for this part.)

When re-installing these bolts, it is also very helpful to have a magnetic socket.) Also while re-installing, remember that the left (port), forward bolt secures the ground straps (2 of them: one to the battery, one to the PCU) to the frame.

Pull the entire transverse frame forward, and push the PCU as far to the right (starboard) as possible. Be careful that the stud on right bottom forward of the transverse frame doesn't stab into the coolant hose coming out of the motor.

Remove the hose clamp and disconnect the hose from the left side of the PCU. Grind the tab off of the hose clamp that prevents it from being opened fully (if not already done).

Disconnect the 12V power cable from the PCU (Torx25 or 4mm hex).

Under car:

You should have already done this:

Pinch off both coolant hoses near the PCU with sufficient room for removing the hose clamps.

Remove the hose clamp and disconnect the hose from the bottom of the PCU. (Collect coolant in a drain pan.)

~~Optional:~~ (No, this is really the way to do it:) Remove the bolt that secures the forward end of the 12V battery bracket to the frame. This will allow the transverse frame to be pulled further forward providing larger access for removing the PCU.

Under hood:

Disconnect the coolant vent hose from the top of the PCU.

Remove the PCU. Be careful not to damage the glass magnetic switch (part of the EPO circuit) that is exposed with the PCU front cover removed. (I usually re-install that cover with a few of the bolts just finger-tight.) Use a strap around the right side of the PCU, looped inside of the coolant fitting so that it doesn't slip off the end, tip the PCU forward and lift the PCU out. ~~If clearance is tight (or maybe as an alternative to removing the 12V battery bracket bolt no, it's totally worth it to take out that bolt), the transverse frame can be secured forward with a bungee cord.~~

~~Remove the 3-phase cables from the defective PCU and install them into the new/reconditioned PCU. Be careful to not drop any parts or tools into the PCU. I apply some Curil K2 to the cables' rubber seals.~~

~~Install the front cover to the defective PCU, package and ship back to Indiana. This bit doesn't really apply to your situation.~~

Install everything in reverse order of removal.

When installing the PCU to the car, make sure the 3-phase cables pass through the transverse frame and not under or behind it.

When the PCU is adequately reinstalled (all electrical connections are made, ~~blind plugs installed,~~ coolant restored (I don't usually reconnect coolant for a quick verification), PCU front cover reinstalled, motor connected) (but before wasting a lot of time with mechanical installation), verify that the heater high voltage AND low voltage connectors are connected, and then verify again that they are both connected, and then connect the 12V battery and ~~perform the Transponder Learn Guided Routine using the Think Diagnostics tool through the VCU. Both keys must be present.~~

Verify that the vehicle runs and charges properly.

I recommend disconnecting the 12V battery for the duration of the reassembly, especially installing the 12V battery bracket bolt installation.

Continue reassembly.

Refill coolant and don't forget to electrically reconnect wipers and the vacuum pump.

Don't forget to reattach the hood release cable.