

## REBUILDING MITSUBISHI ECU/ECM'S

Mitsubishi specified certain electrolytic capacitors from 1989 through 1994 made by Rubycon Electric. Here is the most common culprit of ECU trouble:



Over time and at repeated elevated temperatures these start to degrade. The liquid electrolyte begins leaking from the seal on the bottom plug of the capacitor. This liquid is very corrosive and conductive. It interacts with the humidity coating on the circuit board causing an array of problems. Among these are: injector trouble, erratic start, stalling, rough idle, check engine light, etc. This leaked substance begins to spread and react with metals in its path. It gradually causes erosion of copper traces and shorts in circuit paths. At first you may notice intermittent problems that occur from this. Most often though, the degrading capacitors continue to operate within tolerance and the damage remains minimal. This is where we want to pull the unit and get busy.

If nothing is done, problems surmount. The breakdown of the humidity seal, corrosion and shorting of circuits, and ultimately, the loss of other critical components in the ECU. (i.e. large voltage spikes that cause major damage) all lead up to an untimely demise. At this point you may actually smell something burning inside the unit. (This fried electrical smell is putrid to say the least) The idea though, is to get to the source of the problem before you reach this point. Not to say that it isn't still repairable. But the longer the problem is ignored, the more difficult a task it will be indeed.

The scope of this info pack focuses on fixing the main trouble in most ECU's. If there are other needed repairs on the core they can also be done at relatively low expense. (With the exception of non-serviceable IC's and miniature surface mount components)

The proceeding pages list the step-by-step account of rebuilding said item: ECU/ECM by replacing capacitors and repairing circuitry. By continuing to read this material past this point you do hereby agree to the following:

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## **Take the faulty ECU out of your vehicle.**

You may have to refer to a shop manual or call your local car dealers service department and kindly ask them where it is located. Car manufacturers put them in different places depending on the make and model of the car. Some are located in the engine compartment, others inside the cabin of the car under the dash or inside one of the kick panels, either the passenger or drivers side. Some ECU's are also located under one of the seats and some even in trunks. It will be your job to find out where yours is located on your particular vehicle. Once you find it, take the wiring harness connection off and take the bolts (usually two) off that hold it to the body or frame.

## **Update:**

### **REMOVE AN ECM / ECU**

**\*NOTE: not all of the ECU's that this information will work with will be listed below, but these areas will be a good place to start looking if your vehicle is not listed below.**

## **Steps to remove the ECLIPSE, LASER and TALON ECM / ECU (1989-1994)**

*The engine computer of this model is located behind the radio and heater controls in the center consul. It is removed from the center consul closest to the firewall.*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage
2. Remove the decorative trim of both sides of the center console housing using a phillips screw driver.
3. Unplug the computer from the wiring harness

4. Remove the 4 retaining bolts using a 10mm socket.
  5. The ECM/ECU is now ready to be removed.
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## **Steps to remove the MONTERO, B2600, B2200, MIGHTY MAX, MITSUBISHI TRUCK, AND DODGE D-50 PICK-UP ECM/ECU (1989-1994)**

*The engine computer of this model is located behind the passenger kick panel.*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage to the unit.
  2. Remove the passenger kick panel using a phillips screw driver.
  3. Unplug the ECM/ECU.
  4. Remove the one or two retaining bolts using a 10mm socket.
  5. Gently remove the ECM/ECU (do not force the unit out).
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## **Steps to remove the HYUNDAI: ELANTRA, EXCEL, SONATA, PRECIS, SCOOP ECM/ECU (1989-1994)**

*The engine computer of this model is located in one of two places. One potential area would be behind the passenger kick panel. The second would be under the dash on the drivers side.*

### *Passenger kick panel removal*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage to the unit.
2. Remove the kick panel using a phillips screwdriver.
3. Unplug the ECM/ECU.
4. Remove the two retaining bolts using a 12mm socket.
5. Gently remove the ECM/ECU (do not force the unit out).

### *Drivers side dash removal*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage to the unit.
2. Locate the ECM/ECU under the drivers side dash closest to the

kick panel.

3. Remove the plastic cover using a phillips screwdriver.
4. Unplug the ECM/ECU.
5. Remove the two retaining bolts using a 12mm socket
6. Remove the ECM/ECU

## **Steps to remove the GEO TRACKER, SUZUKI SIDEKICK, AND SAMURAI ECM ECU (1990-1994)**

*The engine computer of this model is located behind the dash on the drivers side to the left of the steering wheel.*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage to the unit.
  2. Remove the two retaining bolts using a 10mm socket.
  3. Unplug the ECM/ECU.
  4. Unplug the relay that is attached to the ECM/ECU housing.
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## **Steps to remove the MIRAGE, COLT, SUMMIT (1989-1994) ECM/ECU**

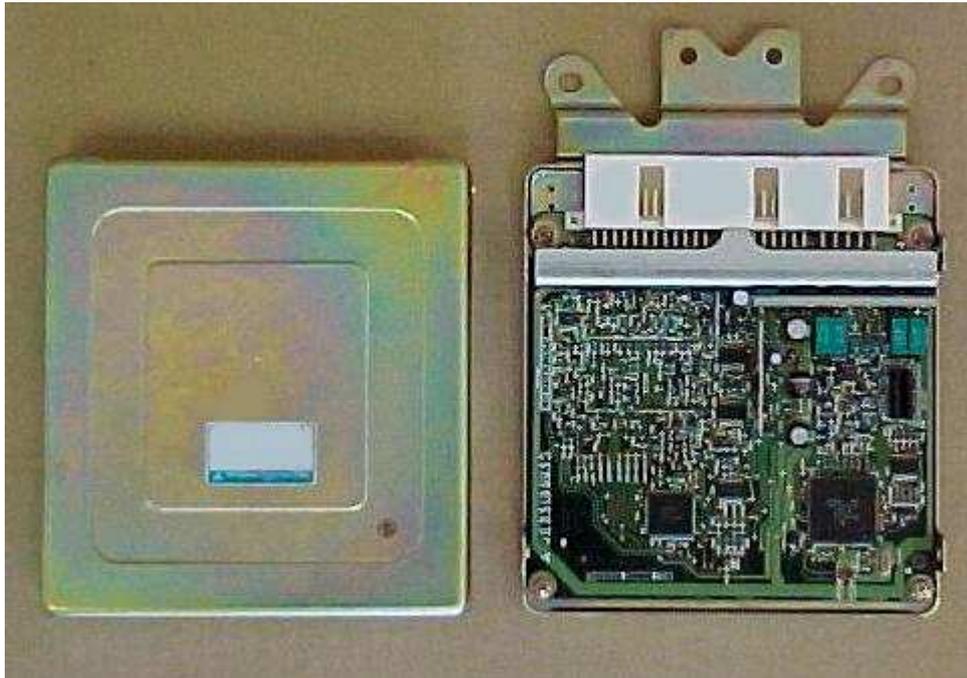
*The engine computer of this model is located behind the passenger kick panel.*

1. Disconnect the battery terminals. Failure to do this could cause permanent damage to the unit.
2. Remove the kick panel using a phillips screw driver.
3. Unplug the ECM/ECU.
4. Remove the two retaining bolts using a 10mm socket.
5. Gently remove the ECM/ECU (do not force the unit out).

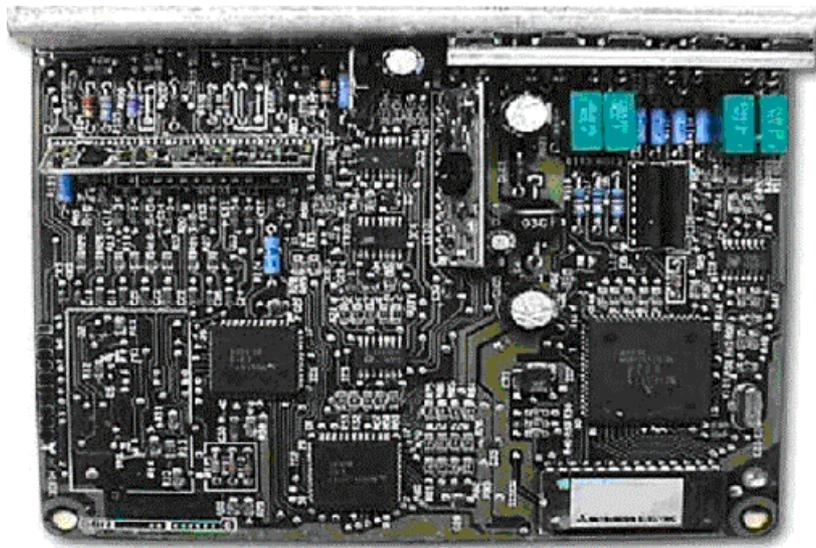
**Remove the four screws from the sides of the ECU and separate the cover from the rest of the unit.**

The screws are on there very tight and you will need a good screwdriver to do this. Make certain it is the right fit for the screws you are taking out. Rest the unit on something soft while on a bench and with the screws facing up, apply plenty of downward force while turning the screwdriver to loosen the screws. If you damage any of the screws and can not get them out, use a good pair of vise grip type pliers and adjust them so that they will fit tight. Clamp down on the screw and back it out a little. You should then be able to use the screwdriver to remove them.

***The unit you are ready to rebuild should look something like this:***



**Take off the screws in the four corners and then lift the circuit board out of its case for proper examination.**



See the larger round/cylindrical electrolytic capacitors on the board pictured above? There are three total. Two of them are positioned towards the wiring harness connection at the rear and the other is just south towards the middle of the board. Let's concentrate on all the larger capacitors for now. The small ones will more than likely be good. That is, unless they are labeled Rubycon. If they are a different brand, which is more than likely the case, they should be fine.

### **Inspect the circuit board on both sides.**

Here is where a good magnifying glass will come in handy. You may see some problem areas on or around the capacitors that look like corrosion or some kind of build up (brown goo). They can be under the capacitors, beside the capacitors and even run down the board from the capacitors. These problem areas can do one of two things. They can eat away at the circuit board itself causing an interruption in completing the many circuits used to carry out functions that the ECU controls. Or, they can bridge circuits, especially in humid weather conditions, causing a short between them in which neither circuit will behave as it should.

Whichever the case may be, these areas will have to be stripped, cleaned and neutralized. This will remove the corrosive substance and residue that commonly causes a reaction to the metals on the board. It sounds like a lot

but this is not hard to do at all and is **ESSENTIAL** in order to begin the other needed repairs.

**Next, strip the humidity seal off of the circuit board in and around all the problem areas.**

To do this you can use Acetone. This is a good strong cleaning solvent that you can buy at your local hardware store.

***\*BE SURE TO WEAR GLOVES AND USE EYE PROTECTION WHILE USING ACETONE\****

We want you to be able to see good enough to repair your ECU and to drive your car when you get it back on the road!! ;-)

The cleaning process involves a simple cotton swab and wipe to remove the humidity seal coating and heavy electrolyte contaminates. This is followed by a toothbrush and acetone treatment to reach all the nooks and crannies.

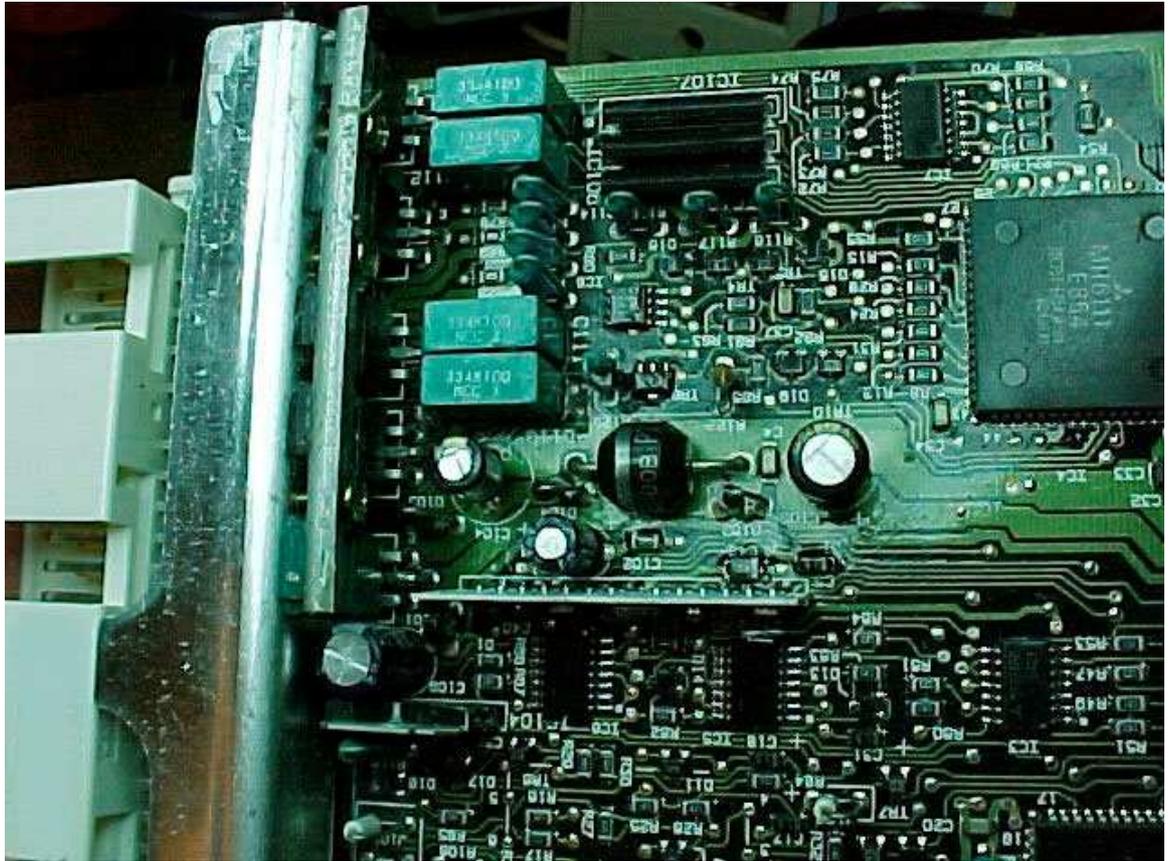
**Use the cotton swab and toothbrush to scrub the board.**

The solvent will dissolve the sealer that is put on the board to protect it. You can use the solvent liberally since it will not harm any of the components on the board itself. When the job is finished you will have to replace this humidity sealer. It is available at some of the better electrical component supply companies. You need to find an electrical shop that can supply this as well as the replacement capacitors after you remove them. Be sure to take the capacitors with you to the parts counter and ask for a replacement with the same value/rating. These are really cheap. You won't believe it when you pay for them. The worst-case scenario is you will have to resort to buying your capacitors and humi-seal online. We live close to a fairly large city and had no problem finding either at an electronics shop.

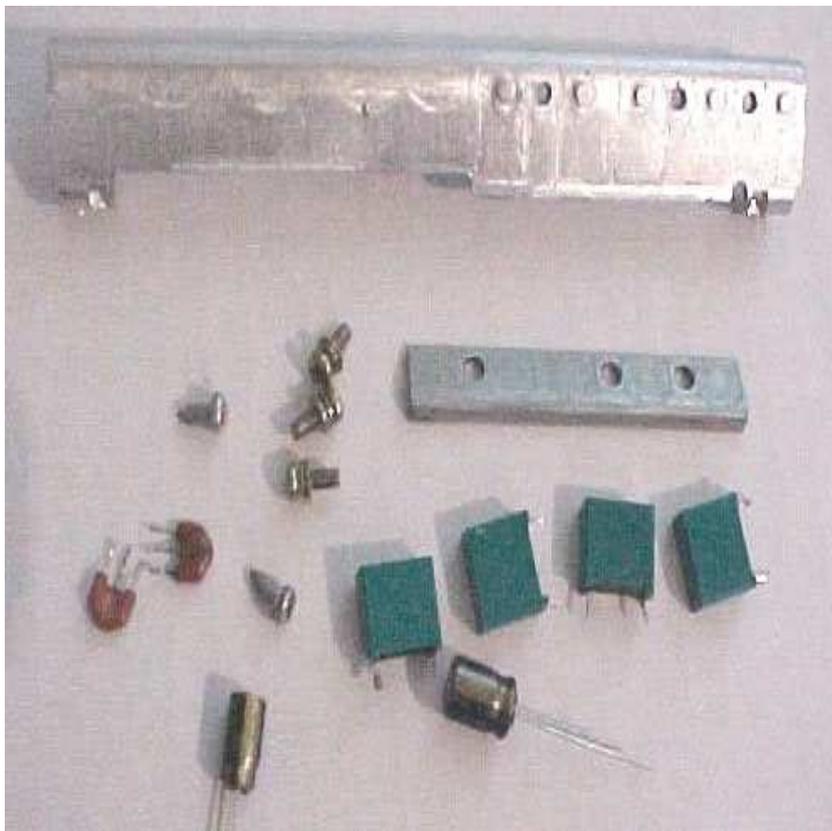
**You may also need to remove the metal strip near the wiring harness connector.**

Take the screws off that hold it and slowly pry it away from the power transistors that are bolted to the strip. Be sure to remove these transistor bolts/screws or the metal strip will not come off.

*The picture below shows this strip and transistors that are attached.*



*Here is a picture that shows this strip & components that are taken off.*



Removal makes it easier to get to the root of the problem.

## TIPS ON SOLDERING / DESOLDERING

***\*IT IS ADVISABLE TO WEAR EYE PROTECTION AT ALL TIMES\****

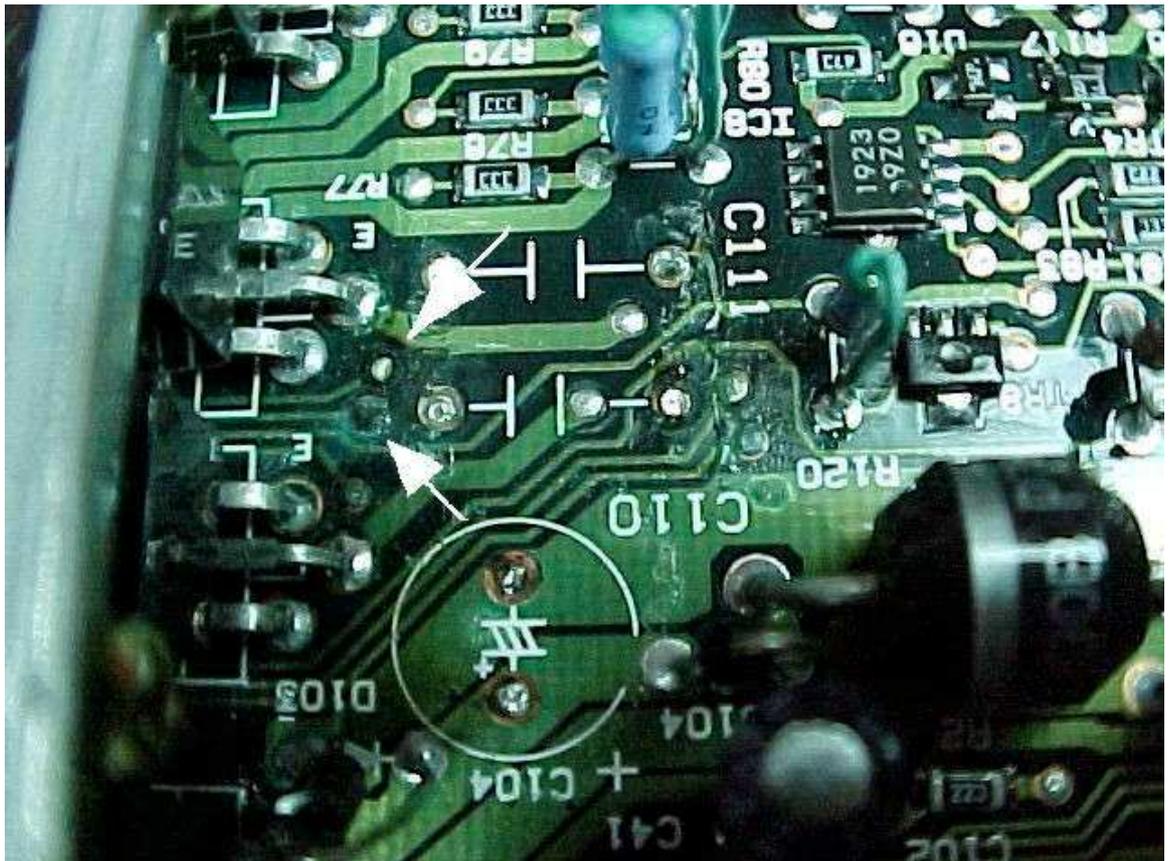
All components and circuit boards must be clean and free from dirt and grease. Clean the tip of the hot soldering iron on a damp sponge from time to time and add a tiny amount of fresh solder to tin the tip. Heat all parts of the joint with the iron for just a second or two at a time.

The large electrolytic capacitors in question will be allocated with numbers on the board i.e. C104, C110 & C111

**Be patient and take time de-soldering the connections of the capacitors, leg by leg.**

Heat up one leg at a time with the soldering iron and apply a little upward pressure with a small screwdriver (If necessary, before lifting the legs, you can use a solder sucker or braid to remove the excess solder from the joint) You can then grab the capacitor with some small needle-nosed pliers and heat the connection on the underside of the board until the capacitor releases.

***Do this until you remove all the RUBYCON capacitors from the board.***



**Once the capacitors are removed, a hobby or craft knife is used to remove the green mask film (on the light green tracks that are the circuit paths in the suspected areas)**

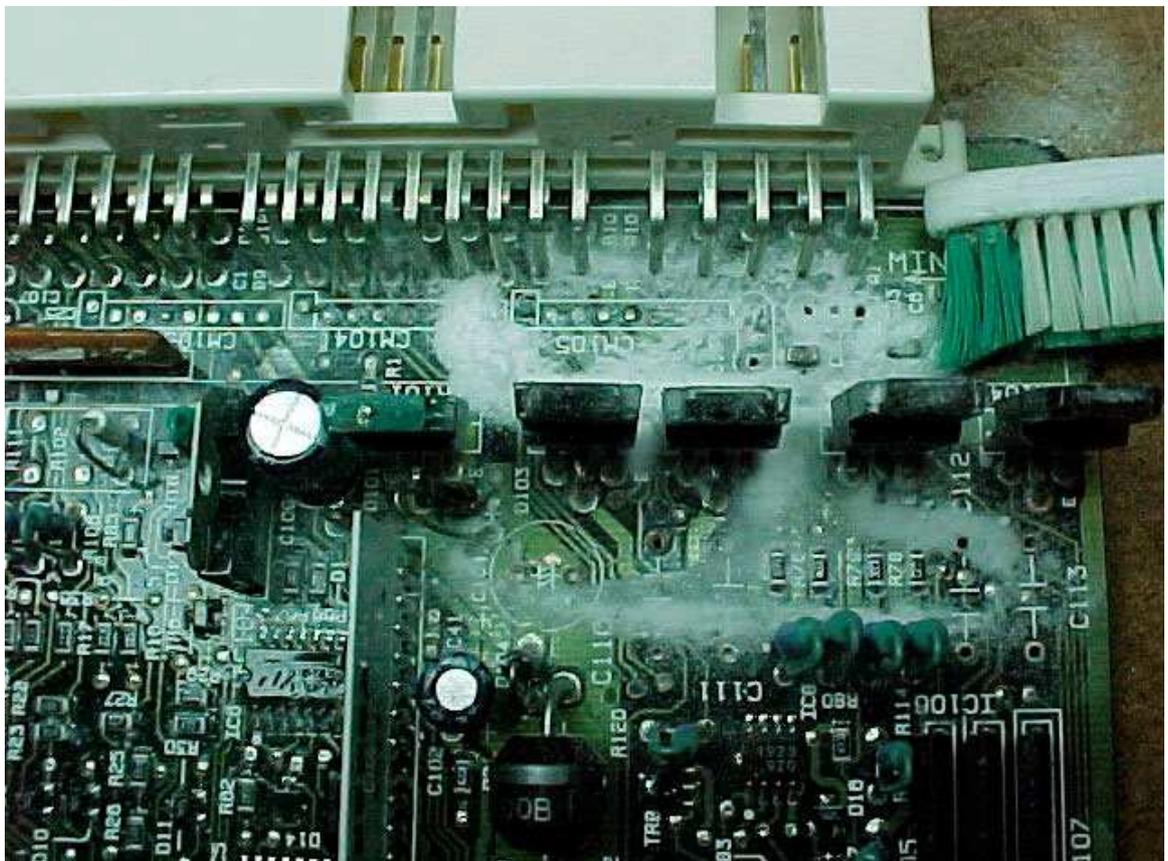
Take the green layers off by lightly scraping with the knife to expose the copper tracks.

**After the board is completely dry, a toothbrush is used to scrub the board with DRY baking soda.**

The soda is mildly abrasive. In addition to removing tarnish left by the solvent, it also neutralizes any acids left over that spilled out onto the circuit board so that it will no longer plague you with problems further down the road.

Once cleaning and scraping are complete it is apparent under magnification that some repair work needs to be done.

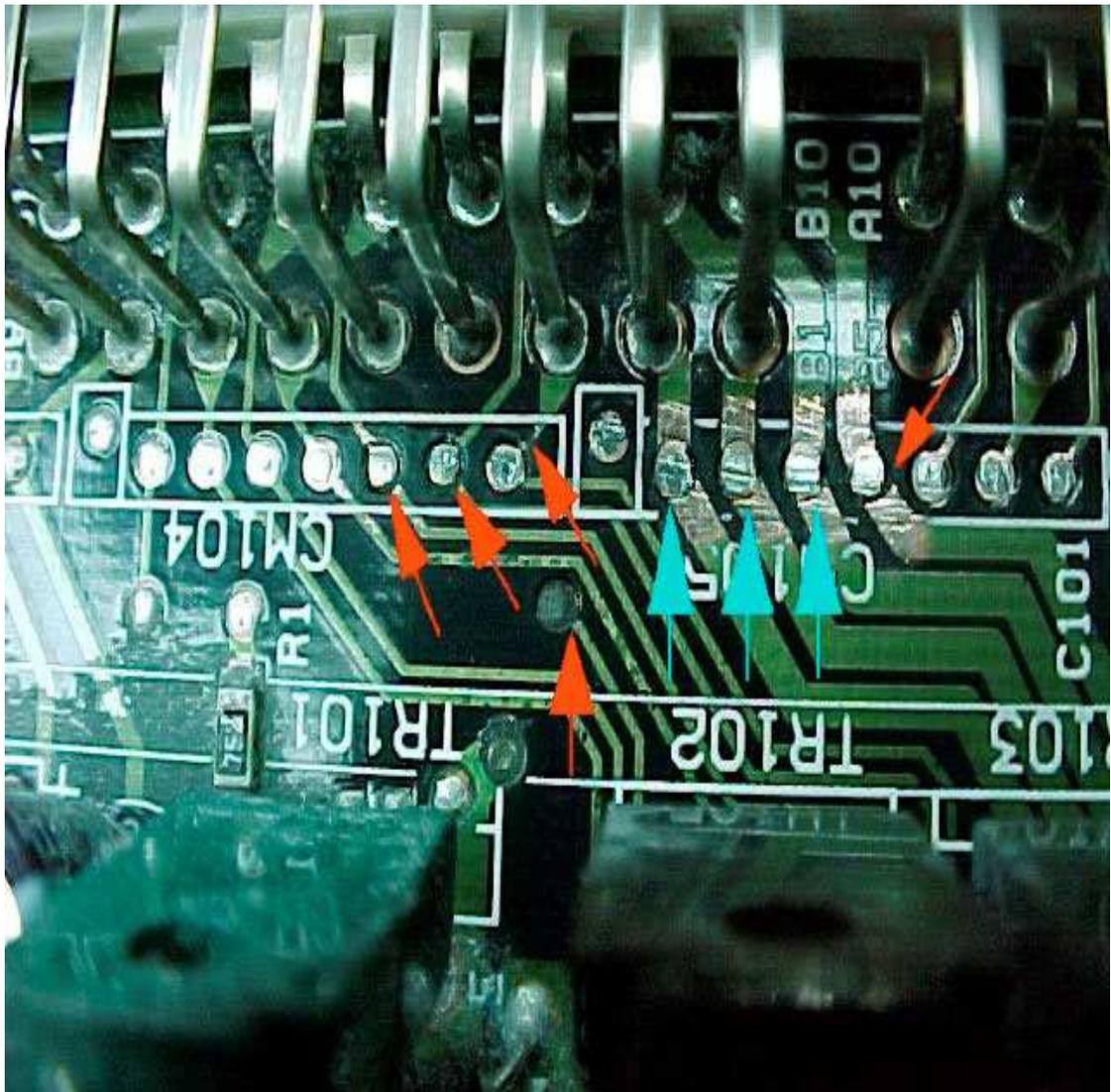
*Below is a photo demonstrating the process of using baking soda to clean and neutralize acids on the board.*



If you see any areas where there are breaks in the circuit traces or at the ends where other electrical components attach to the board then they will have to be made whole again.

You will need to look very close and a magnifying glass is a must have in this case. Another tool, which is handy in this process, is either an analog or a digital multi-meter. With this you can use the ohm meter function to check for continuity of any circuit or copper tracks. Even if the ohm meter checks out the circuit to be OK, if the track looks bad it is advisable to repair the track to insure proper operation of the ECU.

*Here is an example of one ECU and just some of the problems encountered by leaky capacitors:*

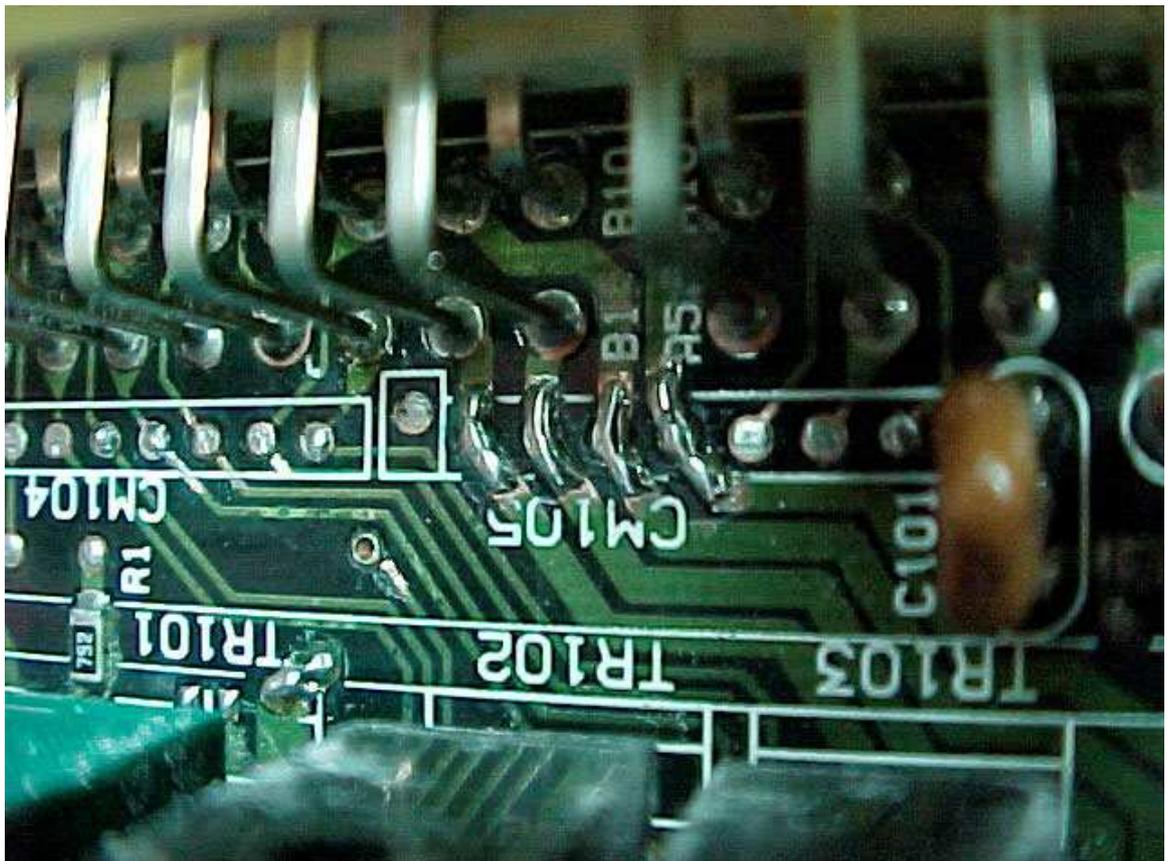


*The red arrows in the picture above show some of the actual open circuits. The blue arrows point to spots in the injector driver area that check ok with an ohmmeter but could cause problems down the road.*

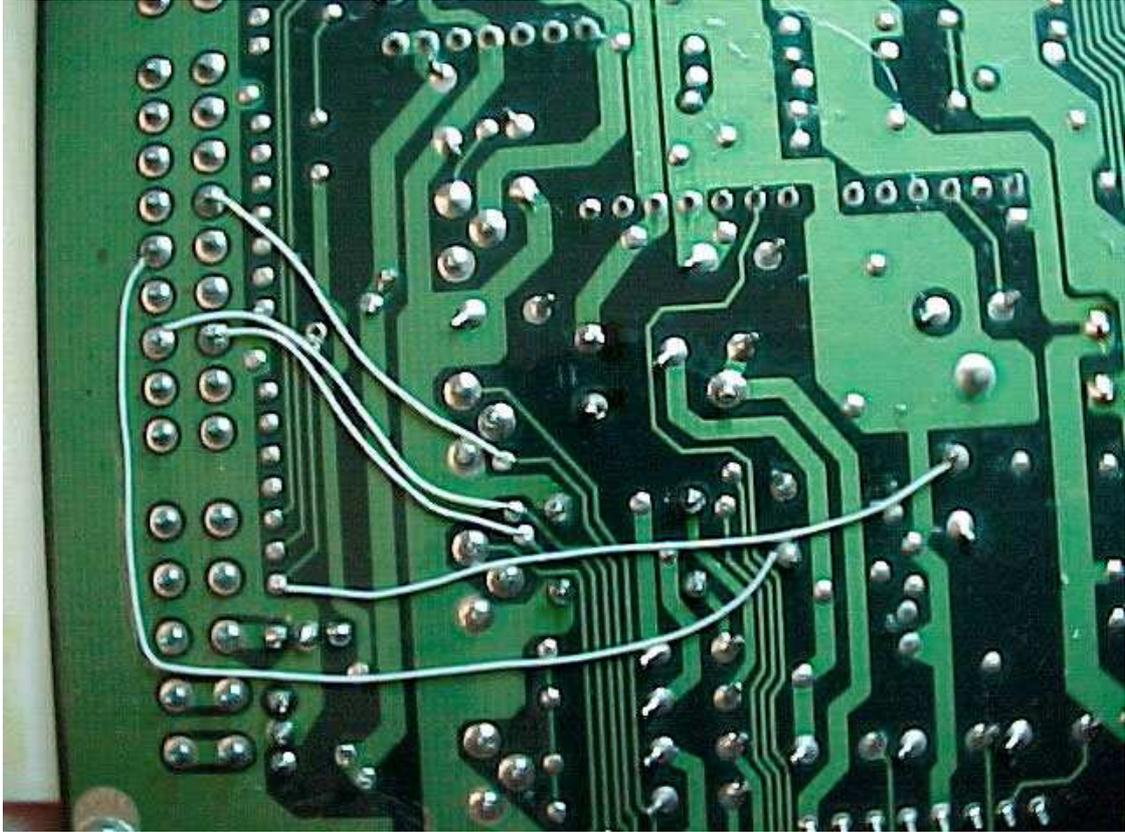
You want to make sure you find all the problem areas and renew their connections to allow a trouble-free running vehicle. Some ECU's will be worse than others. Nearly all will have at least some problems that need to be addressed.

You can fix these open circuits in two different ways. With a short solder connection or a wire jumper. If the open connection is close you can run a bead of solder from one point to another. Simply solder a new track with a soldering iron and electrical type solder. The fine solder available at most electronics stores works well.

*The photo below shows the repairs on the injector driver traces on the top (component) side of the board.*



Alternatively, you can use fine jumper wire available at electrical supply stores to complete the circuits. Look at the path where the circuit tracks run from one component to the next and then solder in a jumper wire to complete the connection. You can do this on either side of the board.



*This photo illustrates jumper wire connections.*

In the case of the repair pictured above: The faulty or open circuit, which was on the TOP of the board, was repaired by running a jumper wire from one component to the next on the UNDERSIDE. This way there was nothing to get in the way, as there is topside where components protrude.

**Now you are ready to install your new capacitors.**

Be sure to get the **polarity correct** ( + / - ) when you install them. Not doing so will cause even more damage to your ECU and you will be back to square one. If you look at the capacitor, the negative symbol ( - ) will be printed on one side. Also, the circuit board should show a schematic representation of a capacitor (Ref photo on page 7). This will usually show which side the positive ( + ) leg goes in. In this case, just use common sense and DO NOT put the negative leg in this side. Follow this rule of thumb and you can't go wrong.

After your capacitors have been installed you are ready to add a fresh humidity seal to the board. Clear lacquer works well as a humidity seal for circuit boards and is readily available at most hardware stores.

***NOTE: Make certain that you have the board completely dry before adding the humidity seal. Whatever moisture is there at the time you spray the seal on will be locked in there when it dries. It may seem insignificant but it is VERY IMPORTANT to have a completely dry seal.***

After you seal it properly, let the board dry completely before continuing. After it is dry, you are ready to reassemble the board.

**Once reassembled, put it back in the case, reinstall it in your car and give it a test drive. You should now have a working ECU!!**

If you still have problems with your ECU, do not hesitate to take it off the vehicle and go through the procedures outlined above again. It is possible that you may have missed a spot that is the cause of the problem and you may find it when you check out the board again.

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Thank you for the purchase of this info pack. We sincerely hope that you are able to solve any problems you are having with your ECU/ECM and that this guide saves you time and money.

You may find these websites below helpful as well.

<http://www.iserv.net/~alexx/lib/libindex.htm>

<http://www.anatekcorp.com/>

<http://www.elexp.com/>

[http://www.repairfaq.org/REPAIR/F\\_Repair.html](http://www.repairfaq.org/REPAIR/F_Repair.html)

[http://www.repairfaq.org/REPAIR/F\\_tshoot.html](http://www.repairfaq.org/REPAIR/F_tshoot.html)

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