



Reversing
Prius
HVAC Display



Preamble/Disclaimer/Caveats/Etc...



This procedure requires a certain familiarity with electronic assembly and some fine motor skills. I do not know what a new HVAC display assembly costs if this one breaks or is ruined in the process, so before you decide to try this, you may want to find out!



You will be working around electronics, so try to do that in a static-free area or at least find a way to keep static down. Damp basement, high humidity area, bare feet, etc.

As with most others on this site, this is what I did to my personal car. I cannot recommend, encourage nor discourage others from doing this but in any case I take no responsibility for individual results! Attempt at your own risk. And who knows what the dealers will say when they see this! If in doubt, find an expert. Japanese bike riders do this all the time. Even some watch enthusiasts do it to LCD watches. Ask around if you are unsure of your skills...

One last very big caveat. This display uses a combination of transmissive and reflective “backlighting”. At night LEDs shine through a dispersion panel to light the display as shown above. During the day the LEDs are off and the reflective front surface of the dispersion panel simply reflects daylight back through the panel. This is not ideal during the day, as can be seen in this picture – it is a little dim, but readable. I kept the radio display in the picture so you can contrast the brightness. I am going to look



at a few ways to “fix” this. It might be possible to change the LED wiring to feed from the IGN power instead of the Tail/Park power so that the display LEDs are on all the time – I will be checking the wiring diagrams. I also have a very nice electroluminescent panel that should fit behind here which could stay on all the time (and probably change the color of the display a bit). Lastly, I have some different dispersion film that I can try, although I think it might be less reflective, not more. You will have to decide if you can live with a dimmer day mode to get a nicer night mode. For me, it is not as if the display is crucial to driving and I hated the ‘70s LCD panel look of the OEM.

Materials

This procedure requires some new material. You need to acquire a piece of commercial quality gray polarizing film. I got mine from 3DLens.com. They shipped immediately from Taiwan and I got it in about 2 weeks. You need a rectangle that is 5in x 1 1/8in (13cm x 2.6cm). The problem is, it is hard to tell the orientation you will require without having everything apart (and unusable), so unless you understand polarizers better than me I would suggest a large sheet – search for part P210.

There are US suppliers. However US shipping rates to Canada are outrageous – I get stuff from Taiwan for about \$2 regular post. I will wait so as not to pay \$97 shipping and brokerage fees from UPS for a \$10 item!

Ideally you want a polarizer with adhesive on the side facing the LCD panel and for that reason I selected the P200. Much to my surprise, the polarizers have different characteristics depending on which side is facing you and when I got the deepest black background, the adhesive was on the wrong side (facing out)! I fiddled a lot (and may fiddle some more) but in the end attached the polarizer without adhesive and it seems to work fine as can be seen in the picture above. However, because of that, I had to leave the (very clear and thin) protective film on the adhesive side, so no adhesive is probably better. (Adhesive on the correct side is best but I have no way of telling that without trying lots of different sellers)

Note that these panels have protective film on BOTH sides, which is great but it should be removed before installation (see more below).

So – once your polarizer arrives, take it to the car, look through it at the LCD panel and rotate it to make sure the screen goes black. If it doesn't, something is not right! Mine rotated to black at about a 45° angle (another reason you need a bigger piece). Check the polarizer from both sides and see which gives you the best black. This is not completely accurate as the display already has 2 polarizers on it so you need to do this again once the OEM polarizer is removed.

Tools

- Nylon Panel Tool set

If you are working on your car, invest \$15 or \$20 on a set of panel tools from Harbor Freight, Amazon or Princess Auto (Canada). They are worth their weight in gold and your car (and resale value) will thank you.



- Masking Tape

- “Scotch” Tape

- Philips screwdriver – medium head

- Painter's single-edge razor blade (Much better than an Xacto knife or other edges for this situation)

- Goof Off

cont'd...

- Windex or equivalent or glasses cleaner
- Paper towel
- Microfiber lens/glass cleaner (like for PC or phone screen or glasses)
- Ruler / Straight Edge
- Scissors

Procedure

Car Panel Removal

I will not go into detail about removing the panels to get to the display, assuming that if you are attempting this, you are familiar with how to do this already. If you need more detail, I can PM you or write more!

Remove the panels in the order shown at right. I use the masking tape to tape the edges where I will be prying with the panel tools. It saves some scuffs and scars! Be careful, one of the white connectors under the transmission panel is identical to the gray connector used for the display. DO NOT mix those up!



Once you get the 3rd panel off (the radio head surround), the display assembly is fully exposed. Carefully grasp the left and right edges and pull up to release the assembly. There is a connector behind the assembly on a pretty short wire harness so do not pull this with all your might and rip the wires out! Remove the gray connector from the back. Bring the assembly in to the bench or kitchen table.

Disassemble the Display



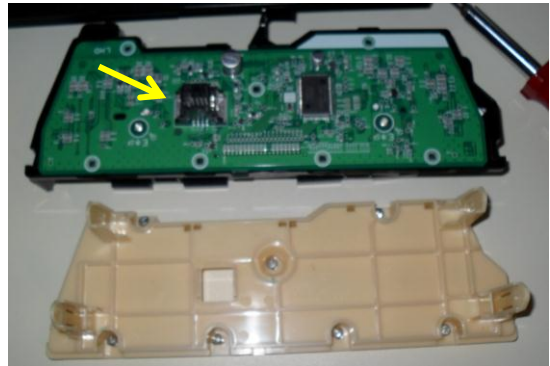
This is what the display assembly should look like on the bench.

Turn it over and unscrew the 7 or 8 (I think) Philips head screws. You do not have to remove them. They can stay captive in the back cover. Lift the back cover off and set it aside, making sure the screws do not fall out.



This is what it looks like after you take the back cover off.

GROUND yourself (I have an anti-static mat under my laptop, so this is easy for me to say). Grasp the circuit board by the black connector housing (arrow at left), trying not to touch the electronics and lift the board out. You should encounter a very little bit of resistance as a gasket on the display releases, but no real effort is needed.



You MUST do it this way. Holding the pieces in both hands to remove can result in some extension pins falling out of the black housing and it is difficult to remember/see where they belong.



Set the black housing aside but keep it face down so the extension pins do not fall out. Those pins are circled in yellow at left.

Flip the circuit board over to have a look at the display – this is our target! Let's turn this frog into a prince!



Flip the board back over with the display down.

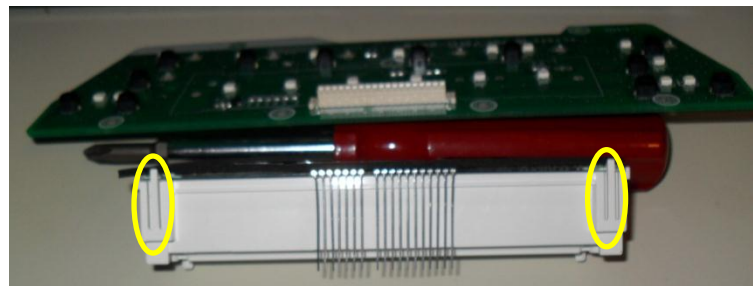


Remove the 2 Philips screws and set them aside. Again don't touch the electronics.
Flip the board back over.

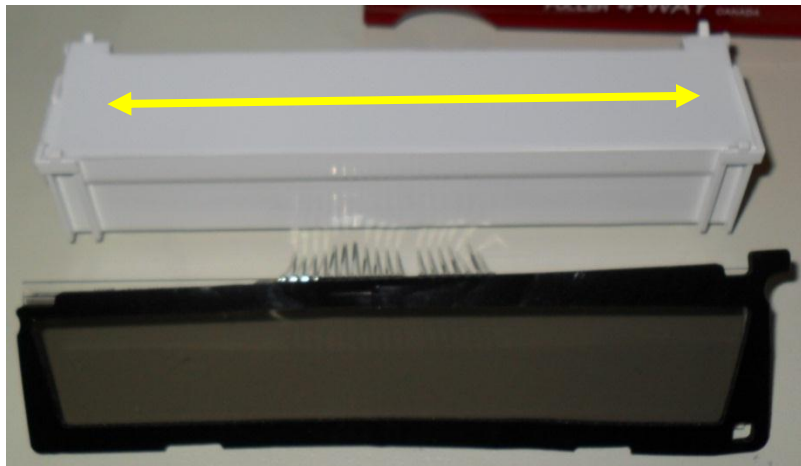


Rotate the board so you can see this connector. You will need to grasp the circuit board in one hand and the white plastic stand-off in the other and pull the units apart. The only thing holding them together is the connector and pins you see above the screwdriver at left, but the connector

is stiff. It is possible to unclip the LCD panel and pry it up to release the pins but it is small, sharp, glass and breakable, so I think it is better to lift the whole assembly. Be careful not to bend the pins too badly! Also don't be prying on the circuit board – it can crack, a component can break or loosen – lots of bad outcomes here. One hand on the edges of the circuit board and one hand around the holder/LCD worked for me.



Set the circuit board aside to work on the panel.



Unclip the 2 long pins on the connector side (in yellow above) and the panel should lift right out.

Note the dispersion plastic at left. You can take this out, but don't get it dirty or crease in any way. My display had a small flaw in it from delivery but I never complained. When I took this panel off I saw that the flaw was actually a crease in the dispersion panel. I tried to

flatten it to no avail and then thought of the "solves-all" heat gun and gave it a shot. Above is the result – a perfectly flat piece of dispersion plastic again. Miracle material! The panel does not need to come out (in fact MUST be there) but it is keyed to fit properly if you take it out to look at it. You will see that the front side is shiny, to reflect daylight. The back side is matte to absorb and reflect the LED lights below it on the circuit board. This is how most LCD panels disperse the backlight.

Set the white holder aside.

It is probably smart (not me!) to place a couple of strips of masking tape across the pins at this point to help protect them from the rest of this procedure. If these looong pins get too bent out of shape they will be very difficult to re-insert in the connector.



Unfortunately, this is where it got scary and I stopped taking pictures so descriptions will have to do.

First flip the gasket up off the panel as shown above. Mine was held in place on the pins by glue or something and I did not bother to try to take it right off. You might want to tape it to the tape over the pins just to hold it out of the way.

Look at the panel carefully to see the layers. The top-most layer is the polarizing filter. Use your new filter material as a guide for the thickness. The filter should be slightly smaller than the glass LCD panel underneath it and a lot thinner. You should be able to see it at the edge (note the black-looking border) or feel it with a fingernail.

Now that you know where it is, place the panel down at the edge of the bench with the pins hanging over the side of the bench, so the panel is flat on the bench. Place something like a paper towel underneath the LCD panel for cushioning and to prevent scratching. You do NOT want to scratch or crack the panel or bend the pins from uneven forces.



!WARNING! – THIS IS THE POINT OF NO RETURN. ONCE YOU START LIFTING THE FILTER, THE PANEL IS COMPLETELY USELESS UNTIL THE ENTIRE OLD FILTER AND GLUE IS REMOVED AND A NEW FILTER IS CORRECTLY PLACED ON THE PANEL. IF IN ANY DOUBT, FIND SOMEONE TO HELP WITH THIS. Changing the filters is common on Japanese sport bikes. Go to your local shop and they may know someone.

Now you have to use the heat gun to soften the glue holding the filter. Keep the heat low, keep the gun moving and you only need 5 or 10 seconds. Remember, less is better than more. If the glue is still stiff when you try to lift it, heat a little more. This part requires the most care and PATIENCE (something I am not known for!).

Once you have heated it a bit, get the blade and try to lift a corner of the filter. Slow and easy... Repeat heating and lifting. You are probably going to break pieces of the filter off. Once that happens, you might as well keep going, as the panel is ruined without a new filter. You will notice that there is a lot of glue left behind and it turns the panel opaque – don't worry about that. Once you lift enough of the filter and apply enough heat you can probably peel the rest of the filter off. Again, nothing fast or too aggressive or you can crack or break the LCD panel glass...

Throw the old filter away.

Put some Goof Off on the twisted corner of a paper towel and spread it around on the surface of the panel/glue. Then use the razor blade to gently scrape (shave) the panel. Most of the glue will come off on the blade. Clean the blade, apply more Goof Off and repeat until the surface is pretty clean.

[This technique will NOT work on all LCD panels in case you decide to try your watch (this is done all the time, too). Some LCD panels use plastic substrates and the Goof Off will probably permanently cloud those, ruining them. This panel has a glass substrate (good for us).]

When most of the glue is gone, put more on the towel and wipe until the surface is completely glue free. Spotless. Pristine. Any flaw here will show up on the display.

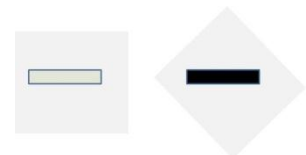
While you are at it, clean the back surface of the LCD panel too. Get rid of fingerprints.

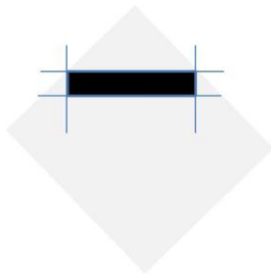
While you are doing this, you may see spurious bits of LCD “lighting up” or even staying “lit”. Don't worry about this. They will reset when powered.

Place the panel back on the standoff, under the clips. The pins are long enough that you may need to set it at the edge of the bench again.

Take your new filter and look through it while holding it close to the panel.

Rotate the filter until you see it go completely black. If it does not go black, flip the filter over and try again for the deepest black. I assume you will see what I saw – that the filter goes black when it is held at about a 45° angle.





Now move the filter to create the least waste (in case you need to try this more than once or go into production for your friends!).

I laid the filter on the panel and used small scissors to make cut marks at the edges of the filter. You can cut a little bigger and trim. You can always trim, but you can never add!

I then put the filter on a flat surface and used the ruler and a blade to lightly scribe the filter in straight lines to cut with scissors. You can trim the filter to fit inside the edges of the white standoff and under the clips holding the whole assembly, like below (sorry no real picture). I show the filter extending between the 2 flexible clips. You might have to trim here to clear the connector pins – I forget!



There are other ways to do this. You can take the dispersion filter and use that to draw a paper template to use as a cutting template for the filter. There is a bit of “leeway” around the edges of the filter so I did not try to get too accurate.

Set the filter aside.

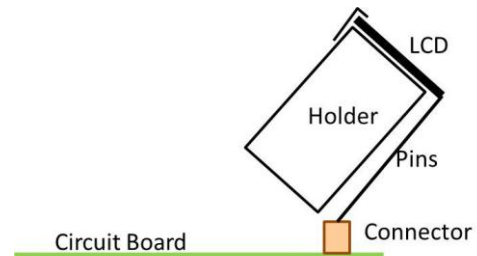
Place the LCD panel back in the holder. Make sure the dispersion filter is behind it and nice and flat in the holder. Make sure the long pins are clipped back over the LCD panel.

Take the tape off the connector pins, making sure there is no residue. If there is, the Goof Off works here too.



Remount the holder onto the circuit board. I found it easiest to do it like this. Tilt the holder and align the pins in the connector (note the gap). Then tilt the holder upright and push down carefully into the board. Check carefully that the pins are in the right holes and are not bent.

Flip the board over, insert and tighten the 2 Philips screws.



Flip the board back. Because of the connector on the bottom of the board, you can work with the board tilted or support the board on both edges to clear the connector.

CLEAN – Now clean the surface of the LCD again with Windex/towel and finally a microfiber cloth. Until flawless, pristine, spotless – again. Do it twice. Check for fingerprints. Again...

For Non-Adhesive Film ONLY



Tip for peeling film. Take a piece of tape and attach it diagonally to the film at a corner. Hold the filter flat on the bench and sharply lift the tape. The film should follow the tape.

Peel the film off both sides of the filter. Handle the filter by the edges and place the filter on the LCD. Do not worry too much if it is not completely flat.

IF YOU HAVE ADHESIVE FILM

Peel a piece of scrap from the trimming process and see which side has the adhesive. Using the natural curl of the filter, compare the scrap with your finished piece and decide if the adhesive is on the right side (facing the LCD panel) and can be used or on the wrong side (facing out) and must remain covered by the film. Removing both film layers of your finished filter might result in the loss of that filter or worse, placing the filter upside down on the LCD and having to start all over again. Film with adhesive on the correct side is by far the best solution but I don't know how you can tell when.

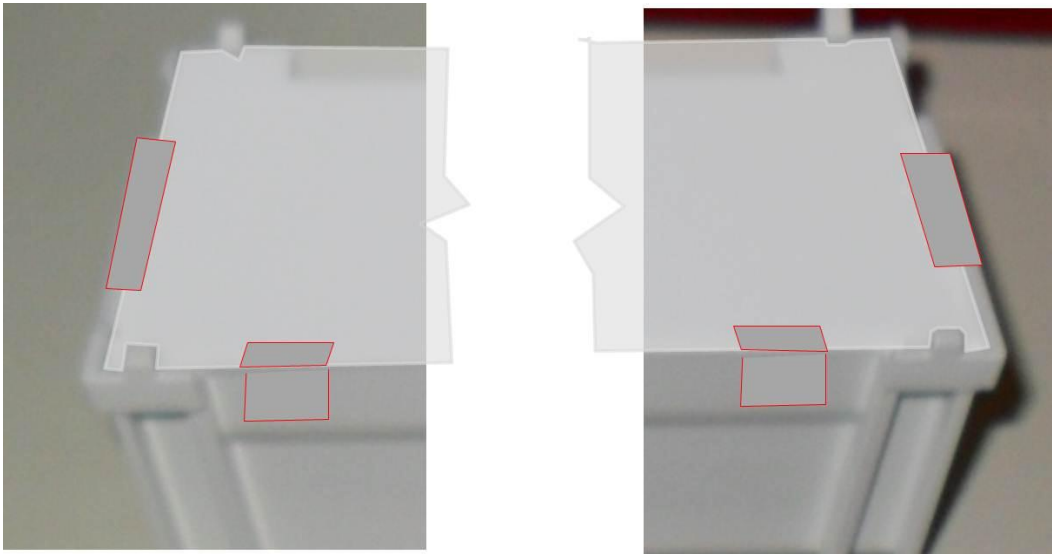
For Adhesive-Backed Film – If the adhesive is on the **WRONG** side (side facing out)

You need to peel **ONLY** the non-adhesive side. Even partial peeling of the adhesive side will pretty much ruin that filter for installation.

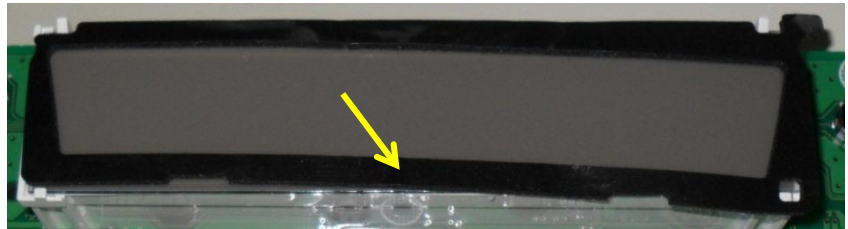
For Adhesive-Backed Film – with adhesive on the correct side

If you have adhesive backed film and the adhesive is on the right side, I cannot advise you since mine did not work! I would suggest that you go back a few steps and place the filter on the LCD panel before mounting the panel back on the holder. It should be easier. You will only get one chance to mount the filter and I think you will need to apply it from one end, squeezing any air bubbles out as you go. Sorry I can't help more with that.

If you are not working with adhesive-backed filter or it is on the wrong side like mine, you need to tape the filter in place (the gasket will hold it better later, but you need to keep it from falling out during re-assembly). I just used standard “Scotch” tape.



To make sure that the tape does not show, flip the gasket back over and align it as it is when assembled and look. You can see there is quite a bit of room under the gasket to place tape around the edges without it showing.



Do not worry if the gasket is a little wrinkled – it flattens out against the glass front of the display assembly when put back together.

If the front of the gasket is dusty or dirty, you should clean that as well, which may then entail another cleaning of the filter!

The filter tends to flop around making it difficult to re-assemble. I rolled a bit of tape sticky-side-out and placed it under the bottom edge of the gasket to hold it in place (arrow above). Make sure this tape does not show.

Double-sided tape would probably work better here for all the tape locations but I did not have any. (I told you, this is what I did, not necessarily best practices!)



Set the panel aside for a moment and get the black assembly (watch those pins!). Clean the inside of the glass for best results!



Invert the circuit board and lower it onto the black front assembly. The gasket will cause a bit of friction but it is pretty easy to push in. Make sure the screw holes are seated against the plastic, so that the circuit board is slightly inside the lip of the black assembly.

Holding the assembly together, flip it over and look in the window. It should be nice and black and the gasket should be smooth and “square” with no marks fingerprints or dust in evidence.

If everything is OK, place the backing plate over the circuit board and replace all of the screws.

You are ready to re-install in the car and test!



Re-Installing

A Cautionary Tale

In my haste to test, I created some problems for myself. I connected the display but did not connect the transmission connectors on that panel. This resulted in a couple of issues and one heart attack (almost). When I started the car to check the display I first got a message that the Parking system was not working and park in a flat area (or something similar). Of course I ignored this because I knew the car was in Park since it goes into Park the moment you shut it off. However the connectors on the transmission panel also control ECO mode, etc. After starting and stopping the car a few times, I completely re-assembled everything and was very proud of myself. Fifteen minutes later I jumped in the car to go pick up a friend and I got the big orange warning triangle over the “Ready” light and a big display saying something like “Hybrid System Problem. Please park the car as soon as possible”. THAT was when the heart palpitations started! It was freezing and I had to pick my friend up from the bus stop so I kept driving. Soon I realized that everything was working – I could change the display back to the normal mode and the battery was doing what it was supposed to do and the drivetrain was in normal hybrid mode (shutting off at stop lights, etc.). The display would revert to the warning, however and the orange triangle stayed on! Visions of failed warranty and \$1000’s in repairs danced in my head! I drove, parked at the bus stop and shut the car off for a few moments. Restarting the car reset the displays and my blood pressure returned to semi-normal!

So a long, windy story to say, connect everything back up before you test. You can probably get all the connectors on without actually replacing the panels.

Once installed, turning the headlights on should light up the display. Not sure what happens when you cover the light detector on the left of the dash – will have to try that out.

Job complete!

Now to try to improve the day-time brightness....

Hope this helps. It sure is long! Willing to answer questions and improve the instructions, time permitting. Thanks for reading.