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DIY Editing Remote control for Panasonic DVD Video Recorders

(A guerrilla remote control to make editing on DMR-E80/E85/E100 just a bit more enjoyable)
The idea works for any other DVD recorders.

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Digital Video Recorders

Hard-disk DVR's are both cool and useful for quick work. They also offer a simple editing (cutting out commercials, setting chapter points, joining and formatting DVD menu). Yes I used the word *simple*, but DVR's are far from simple devices inside. They work with mpeg2 format, they are able to split or join mpeg2 and they do it in real-time and with a good quality. You can do these things on PC, that's correct, but with DVR you don't need to reboot it, it, remove 3 pounds of spyware from it every night, download drivers or breath very quietly near it when it does capture video in fear of drop frames.

Even if you do all editing on computer, these things can be a great time saver for quick work. Except they are all consumer devices and so the word hip and cool overshadow the word ergonomic. They rather put a mirror faceplate than a jog shuttle even that the production cost in China for both is about the same. But what do I expect? For $5000 more I can probably get a big-square-model with large buttons, jog-shuttle, joystick and everything to make editing easier. And maybe even a mirror faceplate for thousand extra.

I have a love-hate situation at home with Panasonic DMR-E85. I like the fact that it can produce great mpeg2 quality, all in real time, partially thanks to the real time temporal NR which allows for much better compression than a software under the same bitrate. But I am always struggling with the remote.

There is a quite capable MPEG editor inside with frame cutting, but this is far from no cozy editing with a mouse. This is not even editing with a keyboard. This is a true punishment for all our TV recording sins. Don't get me wrong, as remotes go, this is actually a pretty good one.

For example to cut out part of recording like commercial is an

exercise worth a game console fanatic. I have to hit Fast forward to quickly find the approximate start, then press Play, hit Forward back to find the exact start of it, eventually hit pause and slow forward or Play or back to get to the spot then hit OK to set Mark In. Oh, good, I've got it. Wait a minute! That's just the In mark. I have to do all this finger-circus for the Mark out!. And again and again - all with small packed buttons on remote where my finger easily covers two of them. I have to do it constantly looking at TV with one eye and looking down on remote with the other to see if I'm not pressing something I would regret.

Of course what I really need is called Jog-Shuttle. Sadly Panasonic doesn't offer any alternative remote with jog-shuttle. It is a consumer product. Jog yourself.

There are some more reasonable universal remote controls and few specialized for video editing even offers a shuttle-like control such as JVC JX-ED11 . Unfortunately you can't really train a shuttle on a device that doesn't support it so you end up with a controller that is more cumbersome than normal buttons.

On the following pages I will describe step by step how I created the home-brew editing controller for the Panasonic E85 DVD video recorder. It of course apply to any other recorder.

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Initial process

I started thinking what I want from a good remote for editing with the E85.

- **large buttons that are far away so I don't have to look down.**
- **jog shuttle or other control that allows forwarding, playing and pausing in one place**
- **buttons for direction controller so I don't have to switch between remote**

The second question is, can it be done in a reasonable time, without a custom processor and without spending much money, preferably using a "garage sale" components?

Of course, generally what I need is to replace the mini buttons on remote with a large ones. Better yet without destroying the original remote, I can get some universal one in a department store, some buttons, wires and a bit of time.

I soon realized that creating a home-brew jog-shuttle with switches is simply unrealistic. Jog-shuttle has to do much more than just switch on or off. But a joystick-like controller will do the editing task as well and it can be done all with switches.

My design was getting its shape. Where to get switches? A healthy number of switches with buttons cost considerably when buying new in a component store. Not even mentioned that you can't really get any good looking buttons. It is one way to go, but I still like the idea of recycling.

Fortunately a small visit to local EB (electronic boutique) reveal the secret source of used switches, joysticks, direction pads and buttons, all in a large groups and sold for just few $. Yes, old gaming console controllers. Presumably various third party Playstation 1 are the best bet. These old third party PS1 controllers often use joysticks, but unlike the new analogue joysticks, these are done by 4-way switch. It just sits in these used controller bins and whisper "Pick me, pick me". As a bonus each controllers has also a large number of buttons, switches etc. The price often starts at $2 per controller and for a $5 you can get a luxury one. Of course the idea is to get the "clickable" controllers that have real switches, instead of the rubber pad.

Here is my pick. I got two PS1 controllers. The first is one will be used for the joystick and all the push buttons. When you are choosing the joystick, listen if it clicks when tilted to side. If it doesn't then this is analog joystick and that isn't what we want. The second controller I choose for the directional pad. This one uses rubber pad switches so we will have to use also part of its circuit board where are the contacts.

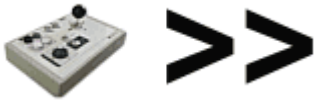
Let's collect all other components. I need some universal remote control that I will disassemble. I had this one Phillips that I got a time ago from Wal-Mart, but never really used it. Then I need some universal circuit board where I will solder all the switches (RadioShack), wires (The PS1 controllers have enough high quality wires in its cable) and a box. Lot of component stores including RadioShack sell plastic project boxes.

First, I tried the Phillips remote with the E85 and noted what buttons I want to "EXTRACT" from it. These were the:

- **<<, >>, Play, Pause, Stop, (obvious reason), these will be wired mostly to the joystick.**
- **Chapter up/down because the Navi screen uses these to go to prev/next navi screen**
- **Directional buttons with OK and Return because everything else is done with these.**
- **The button that controls the Navi screen and Submenu and eventually Record button (because I still got one switch left from the large PS1**

controller, so why not?)

With these buttons I can do all work using the new controller and I don't need to touch the original remote



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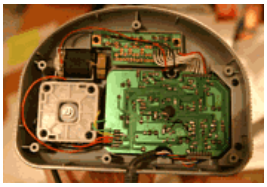
Disassembly

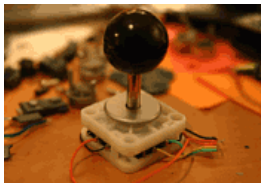
In this step I will try to disassemble the PS1 controllers to collect all the switches, joystick and to salvage the directional pad.

Taking out the joystick is easy. It is all contained into one component After opening the controller I have to take out only four screws and the joystick is main. It will be equally easy to add it to my board.

For the push buttons, this already require some de-soldering. As I de solder the board on the back around the button contacts, they basically fell down.



The PS1 controller from inside before the surgery.



The joystick controller is removed. I couldn't buy better one eve if I try.

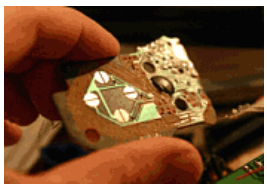
Here are the push-buttons in the original mask.

The buttons are already out.

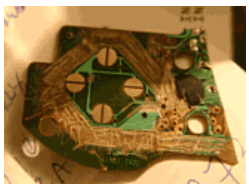
I checked all buttons and the joystick with ohm-meter just to be sure they are all good. Checking every step is the best way to make sure the result will work without any problems.

The last, most difficult part of the disassembly step, is the directional pad from the second controller. Here I have to cut out the circuit board, since the contacts for the pad are on it. Then I have to remove all the unnecessary copper lines and components so only the contacts will remain. Destroying board is much easier than making it. All what is needed is excessive heat from the solder tool and making sure the contacts stay clear.

The second controller will be used for its directional pad only.



I removed the unnecessary lines and to basically have only the contacts.



Here is detailed view at the part with contacts.

This is the salvage so far. A full box of buttons, switches and other goodies.

So now I have a full box of switches, push buttons and screws. I also took out the wires from the controller cable. They are thin, yet strong to sustain the controller abuse each is in different color. What can I wish more.

Now is the time to look at the remote control. The following part is the most delicate.

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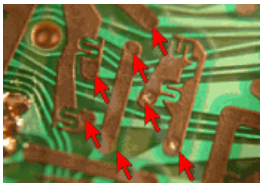
Attaching cables to the universal remote circuit board

This is the most crucial step and if we don't do this step properly, there is no reason to continue.

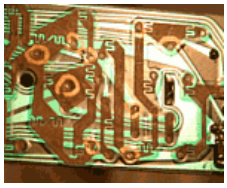
First, let's have a good look at the remote circuit board. The Integrated circuit is soldered to the copper layer. Between the two layers - copper and graphite is isolation. But there are points at which the graphite layer is joined with the bottom copper. If you look closely these are visible as small inset circles on the graphite. These are the best places to attach wires.

Now let's check which contacts we need. I previously list all the buttons I like to use, now I will locate the contacts for these buttons on the graphite and locate the inset joint circles as described above. I will mark these with a marker. Obviously, since the buttons are in a matrix, many will have common wires so I will then check if I didn't mark any redundant joints.

At this moment we have to pause and decide how we are going to attach the wires to the board.
Firs way is to solder the wires to the joints. I must warn you, this step is only for people who have enough experience with soldering such fine elements. This is not easy task and if you are not confident or never done such things, this is not the best time to experiment.
Other, much easier way is to glue the wires there! Yes, there is such thing like a special conductive silver glue or epoxy. It can be bought from radio-amateur stores or ordered online. The silver conductive glue is great invention for this application. Since the contacts on remote are graphite, the integrated circuit doesn't expect for the buttons to be 100% perfectly conductive. In fact you may be able to bridge contacts even with your skin on finger which has quite some considerable electric resistance.
In both ways we have to remember that we would need to place the rubber keypad on the board when setting things up to set the remote code, then we can remove it. This means the wires cannot block any of the numbers or the device selector on top.

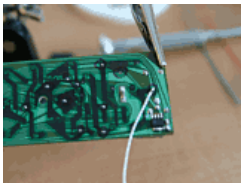


Here are the joints between the graphite and copper layer.



I marked the contacts I need with marker

Scratching the surface and adding solder to the joint

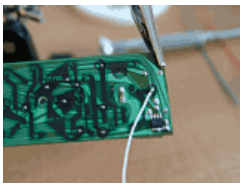


Soldering a cable to the joint

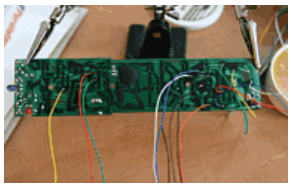
I choose the first method because I am confident I can do it. I spent my teen years with soldering iron in hand and soldering wires to thin layer is not the most difficult job I ever did. Again, warning, if you are not confident soldering, get a glue.
Before soldering I took scalpel and scratched the top of the graphite from the joints to reveal the bottom copper layer. I took special care to be sure I am working on joints between layers, not scratching the isolation on places where these two layers must not touch.
Then I had to put a bit of solder to these joints. This is difficult and it involves scratching the joint with scalpel so the copper layer is clean, using extra flux and always clean soldering tip. Never heat the joint too long. If it doesn't take the solder after few sec, stop, scratch it again, use flux, clean tip and start again. The goal is to put a bit of the solder to the joints so in next phase we can quickly solder wires to them.
I prepared the wires from the PS1 controller cable. They are each different color, which is very good. I leave enough length, it is easier to cut later. Take out a very little isolation, use flux and add solder to the wires. Now

we are ready. Quickly heat the wire in the joint so they get soldered together.
If you are using glue, then all this is much easier. You can actually simply glue the wires to the graphite layer, the best is in place of joints, since there is the strongest bond with the board.

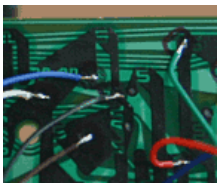
When all wires are there, there is one important step - to mechanically secure the wires to the board. I use for these kind of things hot glue. This is important because while the wire can have good electrical contact with the circuit board, such contact is not good mechanically. It is very easy to break the lines in board when pulling the wires and believe me there will be a lot of pulling later.
I simply secured the wires with hot glue to the edge of the board.
Now I took a paper and pen and by tracing the remote board I marked which two wires control which button. You will be happy to have colored wires!
Before I can go further, I want to be sure I didn't destroyed the remote, so I put batteries in , put the rubber back on top to set the code for Panasonic (My Phillips used 641 code so I had to press-hold learn, press DVD and put the code). Then I took the rubber keyboard off again and tried the device on the E85 by simply touching the two wires I marked. I checked all of them if all works as planned.
In my case all was all right. That means both the soldered joints are fine and I also marked the wires correctly. It is vital to do this step at this stage, because it is much harder to locate bugs later.



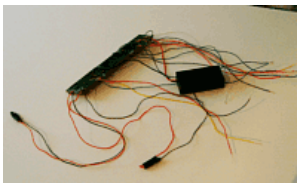
First wire attached.



All wires are now attached using colored cables



A detail of the soldered wires



This is the remote with both LED on wires and a battery box.

I took out the battery and took out the infrared LED and the red LED and solder them to a long wires, then solder the wires back to the board making sure I keep the correct polarity. I simply put mark with marker on one side of the led contact and same mark on the board. If you reverse polarity, you will be scratching your head why it doesn't work.

So this is the most difficult part and it is done, so put it away to safe place

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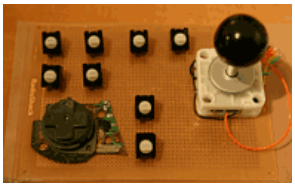
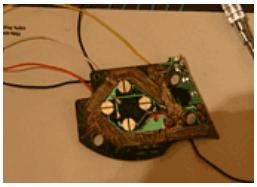
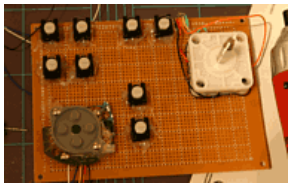
Buttons assembly.
First I designed the new layout on computer in a drawing software, then tried it by placing buttons on top of my board and checking the ergonomy. The goal here is so with each hand I should be able to easily press required buttons, without actually moving the hand from position. So for example holding joystick, I should be able to press OK or Return button with thumb without removing the hand from joystick, same with the directional pad. For the joystick I designed it so left will be|<<, right will be >>, bottom will be pause and top will be play. These are the buttons that are used during editing on the E85 when I want to set mark In or Out. With joystick, I can use all 4 functions without checking my finger position. I will put a stop button above the joystick and record button to the center top where it cannot be activated accidentally.



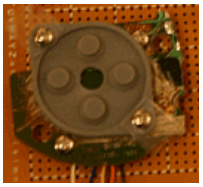
Here I placed all the components on a board to find out the best distances.



I added wires to the directional pad board.



The buttons are soldered and the joystick and directional pad are attached using screws



Here is a detail of the directional pad.

You have to also make sure you will have enough space in the box for the actual remote control board. So at this moment decide where the board will be and leave enough space there.

Then I created bigger holes for the contacts of each switch and holes for the joystick screws. The conductive side of my universal circuit board will be on the reverse side and I will solder the push buttons to it. I also add some hot glue to the edges around the buttons, just to make sure the bond is strong.
In previous step I salvaged the directional pad from the PS1 controller by cutting around the circuit board and removing the lines I don't need, leaving basically only the four contact pads with some lines to them. I made some holes for the wires and attached necessary wires to the lines. Again, you have to check the matrix of the buttons. In my case as it turned out 3 buttons had common wire.
Then I add screws to hold the rubber pad to the little board. The four-way large plastic button will be placed on top of this sandwich and will be actually held there by the outer box so it can freely move.
The next step is to mount the small board with the directional pad onto the main board. Here is important note, we will need to adjust the height later so I used longer screws.

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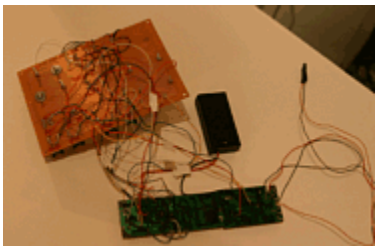
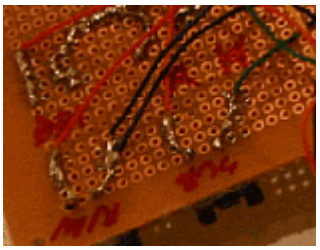
Connecting it together.
When all things are in the place, now is the time to connect the universal remote spider with the boards. Since many of the wires from board will be used by more than one button, we will need additional wires. A word of advice is to use same color of wire for subsequent connections. It will be much easier to fix things later. I simply followed my paper notes since I already tested that they are correct.
Note: My salvaged joystick control is done such way that if the joystick is up, the bottom push switch is ON, when joystick is moved to left, the right switch is ON etc. Just make sure you check this before you solder wires so you do not have to redo things.

There are quite a few wires to be added so it become a bit messy.



All is connected together



A detail of reverse size of the board

Again, time for step testing, I added batteries, placed the rubber keypad over the remote and set the remote code for Panasonic, then removed the keypad. I moved the IR LED on front of E85 and had a deep breath. Then

tried pushing buttons and joystick. All worked perfectly.
This step is then done so I used hot glue gun to attach the many wires to the board so they don't get loose when I will be fitting it to the box. This is always a good step, it saves lot of time in long run.

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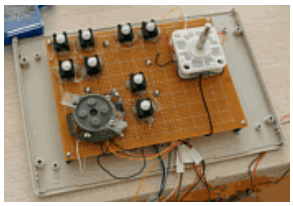
The Box.
I used the project box that is large enough to hold the board and a remote control board inside. I then measured all the buttons placements and draw the openings of the box on computer. At home it is not easy to make things to fit exactly. Remember that. Leave enough clearance around the buttons, we will cover it later. The only precise placement and size is the circle that will hold the 4-way directional button, because it must fit, be loose enough so it works and make sure the button doesn't pop out. All others holes can have much higher error.
So I put it on computer, printed it, cut out the holes, then placed it over the buttons to see how well I made it. It needed few corrections. Then I printed it again, secured it on top of the box and marked the centers of the holes for drill. To drill large holes is not that easy with hand-held drill, you may ask somebody who has table drill to do it for you. The only requirement is the correct directional pad hole size. All others can be larger. So for the directional pad drill smaller hole and use fine file to work it out to the correct size.



The board is attached to the bottom half of the project box

I have to make sure the height of the board can be adjusted

This is how it will be all placed inside the box.

The directional button has small pin to avoid rotating it around.

I attached the main circuit board to the bottom half of the project box with screws that allow for height alignment. Using four screws is not enough. To avoid any bending of the board when buttons are pressed, the screws have to be placed also in center and around larger buttons.
I also attached the remote controller board to the bottom half. This time I used hot glue, since there will be no physical pressure on this board. It is important to have access to the original buttons so the rubber keypad can be attached and the remote programmed. This will need to to be done only occasionally so the rubber keyboard doesn't need to be attached there permanently. I will however store the rubber keyboard folded inside the box so I don't have to look for it when needed.
When I do such things like this, I also always print a schematic or instructions and place them inside the box as well. In this case there is no really schematic, just bunch of wires. But the instructions how to program the remote can be a big help. After year or so there is little chance to remember what I had done, or in this case how do I need to reprogram the remote if the batteries

need to be changed. This little trick saved me previously a lot of trouble.

Last thing is to drill hole to front panel for the IR LED and in top panel for the red indicator LED. I left a long wire to these LEDs so the case can open easy. Again I used hot glue to attach the LED to the plastic case.

The box is closed and buttons are added to the switches.

Here it is assembled with joystick ball.

A top view. It still needs some finishing touch, but it si already fully working

Again, time for step testing, I added batteries, placed the rubber keypad over the remote and set the remote code for Panasonic, then removed the keypad. I moved the IR LED on front of E85 and had a deep breath. Then tried pushing buttons and joystick. All worked perfectly.

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DIY Editing Remote control for Panasonic DVD Video Recorders

(A guerrilla remote control to make editing on DMR-E80/E85/E100 just a bit more enjoyable.)
The idea works for any other DVD recorders.

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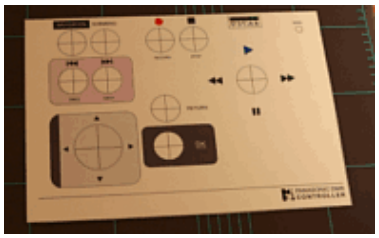
The finishing touch.
All what this new remote needs is some finishing touch. For start we can describe which button does what.
So what we need is a face-plate. We don't need anything too fancy.
A simple design, printed on a photo paper. Then I used a self-laminating sheet and simply put the printout the face to the adhesive side of the sheet.



Printed "face-plate" before cutting the holes

The mask is glued on to the box

Then I cut out the holes with a scalpel on a cutting mat and glued the mask to the top of the box.
After all this I sprayed the top of box with acrylic sealer to smooth out the cuted edges, but it is of course optional.
I realized that the buttons are all in different height and tilted because the original controller was curved. I used this to my advantage, make sure the tilt is placed correctly (lower edge towards me) and choose less important buttons with lower height. This is apparent for example on the Navigation and Submenu buttons.

Since some of the buttons had a writing on them, I sprayed them with Enamel (the one used for plastic models) making white, black and grey buttons. (for gray I used the balck and white).

All is done and my controller is ready for prime-time. It took me about 3 hours for two evenings from dissasembly of controllers to the final touch.

My 4 years old daughter couldn't resist and draw a picture of me working on this project. I am sitting on a chair holding the soldering iron. She is running around with a bunch of wires in her hand that she steal from my table.

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