Enclosure Design of Electronics Equipment
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Lecture - 44
Connector basics

So, we are back again. So far I have covered things like how to make an enclosure using standard extrusions.

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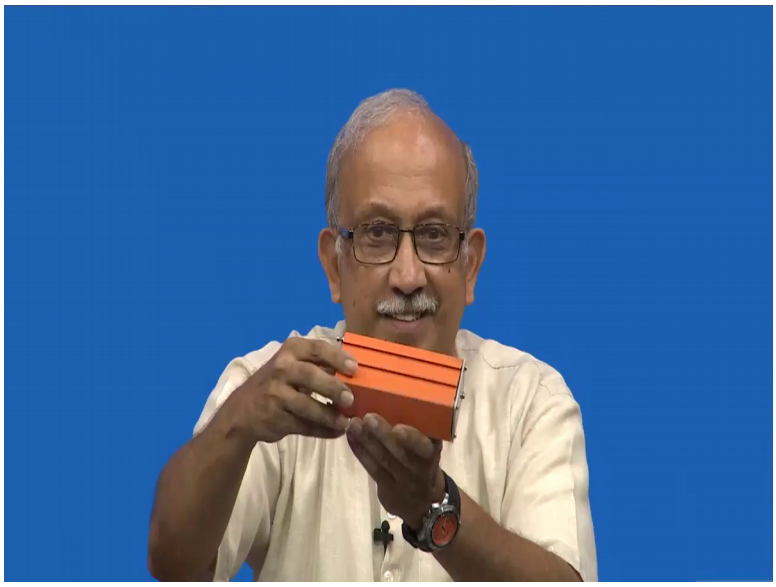

Then, I also tried to show you a little more about how we end up with having to include is secured inside one of those enclosures.

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Now, we come to a very bothersome and we cannot live easily with them, condition that is the connectors. In this case, specifically I would like to talk to you about the electronic connectors which are inevitable. Whenever you need to join two subsystems, we probably end up with this.

Now, have a look at the screen, have a look at this monitor. I hope you can make out most of these things clear. The best of that is clear that is the same printed circuit board which I have shown you there, added to that lot of things, I have been added there is a beautiful some symbol here and so on. Then, something else you will see is we are all familiar with this word HDMI. Similarly, we are all familiar with this term that is the USB and so on. So, coming back you see here this is some device which I do not know. In this case, probably it is a wireless device which will communicate with this PCB.

Now, we end up with a little bit of what do you call angelic and demonic. That is the thing that is this interface reality is we need to often remove parts for either servicing or putting it together or replacement or anything. Extreme level is probably have each component going and sitting in its own socket little like a wish board. So, I will ignore it, but the reality is when it has to communicate with the outside world, it end up with these connectors. Just taking this little thing here, you see here there is some I will not know what it is some devices here and then, there is a beautiful connector here.

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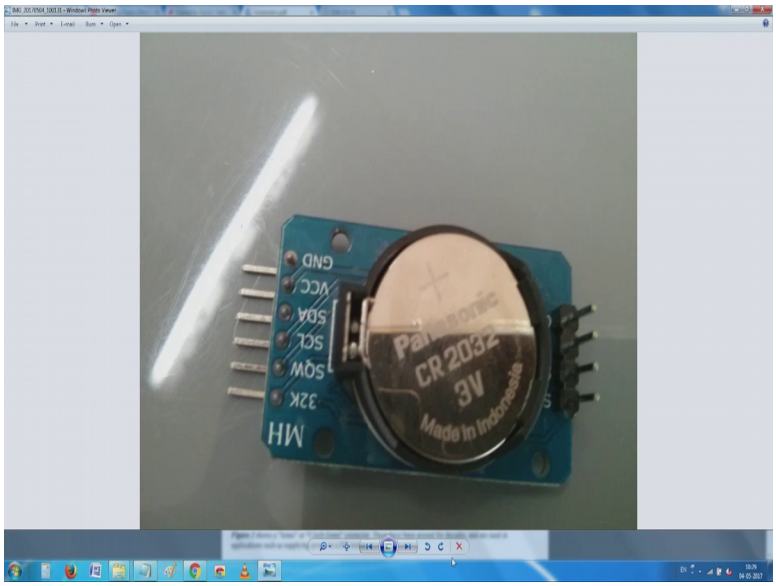

You have seen here there is something which comes here which sits on top of it. So, you have I mean probably type USB and then, you have a mini USB and all that now you know we are here. Why we are here? Everything needs power. We are not yet to play your automatically things can work with gifted power like energy harvesting, but I am sure eventually it will come like some of your id cards and all that the energy is given. I will probably do not need most of them. They have an antenna and the pickup and all the belt. The reality is the other side we end up with this power components. In this case, it is 2032 battery. I mean sorry single cell A3 volts cell internal construction I am not very clear about it and then, one thing you will notice about it is on the cell, I have it here. You see only for convenience sake they have showed.

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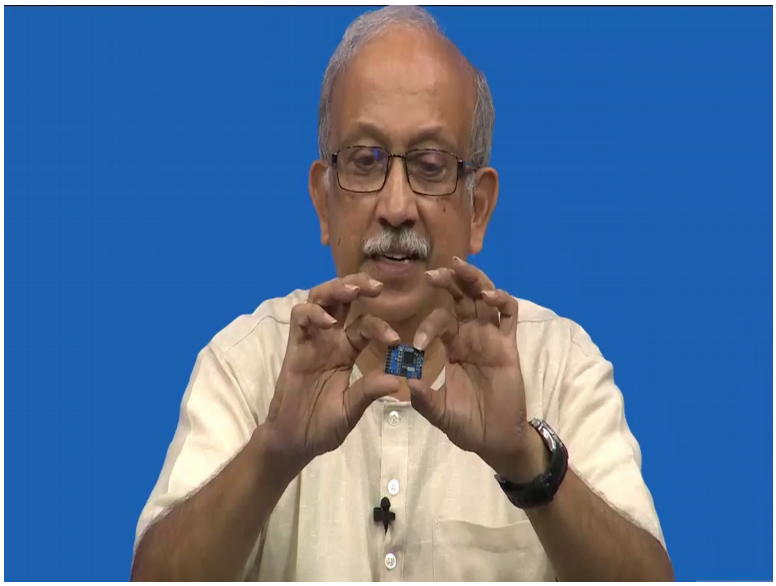

These things and all the circuitry is behind. Now, this thing we will neatly plug into any place we want. I know it is l some SAL SDA VCC and all I am only a packaging person.

You will notice that even the small thing has six pole, some connector here, there is a four pole connector here and the beauty of this whole thing is, it also has a socket to take the power and you should understand that if you see these sockets and all that you see here very cleverly made top and sides from one pole bottom forms another pole. So, there is a nice mechanism by which at the bottom there two spring contact, it split. Single contact still has a problem and the edge you know a longer contact is there because it is there in the magic. It fits neatly like all other items manufacturers have spent tremendous amount of effort and energy to get them into this form. If it is just a simple school project or if you are making the whole enclosure, you can probably buy all the small components and include them in your designs, alternatively you must buy cased things.

One of the first thing you will notice of any of these connectors including this beautiful printed circuit board connector, obviously has two or three things. One of them is those connections to the outside world, another is the shell or the housing which holds it because in a case like this both are critical because this part of it is standardized any what do you call anything which has this USB. I do not know what I call it. I will just loosely call it the USB plug because the shell is the socket shell. This should be able to take any of those thing. So, if you go to their catalogue and if you go to the original USB standard

at given by this thing, maybe you will see that there are beautiful connectors which are built here which to me know it is still a wonder to part of it. It is one of the contact arrangement shell and I am sure this happened all of you a polarization to make sure it does not go inside. I am sure it has happened to you. This I have taken from one of their blogs. First time you try, nothing goes inside. You try the other side, then you will notice that does not go and then, you come back in the original thing. It works and in the process of your trial and error, you have not damaged anything.

So, most important on the other side is the way the termination has been carried out. If the standard lead through hole, they have one way of arrangement. In this case, if you see carefully, the outside shell itself is neatly solded here. So, most of this stress of your trial and error is taken by them and as I said no tremendous amount of interested energy is there. I suggest you to take a closer look later or sir, please connect me to this. You have seen such a lot of effort has gone in providing two small lugs which latch on to that small square fickle openings you have here. On the other side, slightly different way of thing is there the advantage being know it locks and place absolutely has no doubt about it and while all this outside shell is solded to it, this is also something. The actual contacts again now lead through hole in the lead type of this thing, same thing which happens with normal relay made stacks. So, all of them have a standard bitch and then, on the other side, contact configuration is required.

Now, you come to something which is slightly you know different while this is like this if you see this HDMI connector, on this side the standard thing here is there as much as know all the four things and all, but on inside way, it is assemble, it still has SMA contacts. So, as the sub substrate or the pwd technology changes, its interface should remain, but the contacts with other side should change which is the reality of this. How to make this printed circuit connectors? This I think I have shown you. I have a picture here which if my colleague can kindly show me, this here, this again one more printed circuit board where this header neatly goes and engages with this. Here you have seen this. Now, this header engages with this. I am not very clear. Luckily it is not powered. I expect that probably it sits like this. So, I will not risk playing with it and we also have this some beautiful power stuff.

I do not know whether it goes inside or to me it looks you know logically that whole thing will probably fit inside like this good. All this has been made possible because of

the connectors and if you recollect I was trying to show you how to make enclosure using a standard extrusion. You have seen what we have done. We have four standoffs with slide through fully and why is it included here in this connectors thing is when you assemble all these things together, it is expected that it goes neatly inside and probably sits flush here. You have seen now this is where things help.

I have two options here. One is I can probably put a small plate here, mount all these things, then after everything fits inside, try to slide it in and then, you see that I have certain connectors and all on the side also. So, I have both options if I want. When I make the PCB, I can put them here or put the other side and all this neat. I am proud that one of our people have done it now which will come to something which is both the power as well as thing here also know what we cannot avoid is these connectors.

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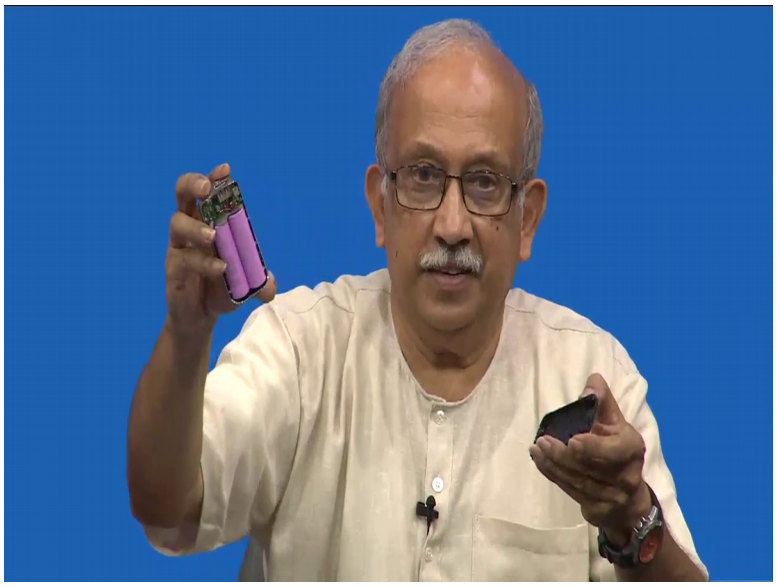

So, if I now try open this, this is the 18650. It says something 26 FST 12 DC 2. I have this beautiful battery bank. So, this has two shells. If I want to open this, probably has a single cell. Now, the thing is after all this tremendous effort, everything will be make or break dependent gone connectors. So, if you are lucky, it seems to work, but the reality is it not what you call trial and error thing. See it is still working. In spite of my this thing, it is still working.

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So, I am in a way I am quite happy. Now, I will take you something close to things at home. I hope you recollect that I had shown you.

Sir please this camera, remember I showed you a very unsafe and sad way of our people trying to use a pressing iron. So, in the pressing iron, the connectors are exposed which is a very ridiculous thing, but that is old, that is I do not know where we got it or how we got it. All I can say it was old. If I go back, I do not know where I drew, kept the pictures was kindly just be with me. I missed it here, right. I hope you recollected and other thing I will punch it up. This is very common. What do you call cloths iron or a loosely called a steam press? It is not really a steam press. A steam press involve, but then its a clothes iron.

We come to the critical part of it. You see these three pins at the back, they are the ones that will give contact with the base here. See nicely everything is shielded. You will not see the source of power. Now, when I say keep it here, it docks neatly and then, it charges it. This one fortunately it holds the heat directly in the base plate. So, it is a power connector flat and built into the equipment directly to me. Why I am showing is there is a common place thing which you see around and then, carefully if you observe things, there are other augmentative call things as that and then, it has the final ultimate thing. The pictures when are so adjusted probably burring testing and even if you talk to them, you can probably connect a cord directly this and then, try to use it as before.

When you want to use it, you can use it as a docked cordless. I will not call it wireless because wireless generally refers to data communication. Cordless is without the power cord. It tries to work. I feel it is a very innovative and cute neat design.

Now, I will move this onto next. Have a look at this. I am sure people have tried various creative use for it. What we know is that it is what are jug and see here.

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There is a beautiful on off switch here and actually the heating element is built into it down there. That is the heating element seen this here and this one controls on/off and also, it has the trip thermostat, but the interesting part in this more than anything else is you have a connector here. Unlike the three pin connector, there it is something which as you docket, it gets connected plus you can rotate it in all directions. So, we come to the effective use of coaxial connector. In this case, cable is not co axial. Only the connector part of it is two of the pins are axial to each other and then, where I thought you know I should also show you the very innovative way of packaging, the whole thing and then, you see here I have a beautiful what do you call water heater where this comes out. I can use it for do not look at my face. It has to go and eventually it will go, right.

Now, the thing being why I did it is you see here how neatly it goes and sits inside and then, after that it rotates here and the magic is whenever you try to disconnect something which is on load, they have a chance of sparking. So, necessary things of you know how to prevent sparking. There is not a full fledged arc chamber as you would find in a

contactor, but still all these elements are neatly enclosed here. Now, I will come back to the first this thing about.

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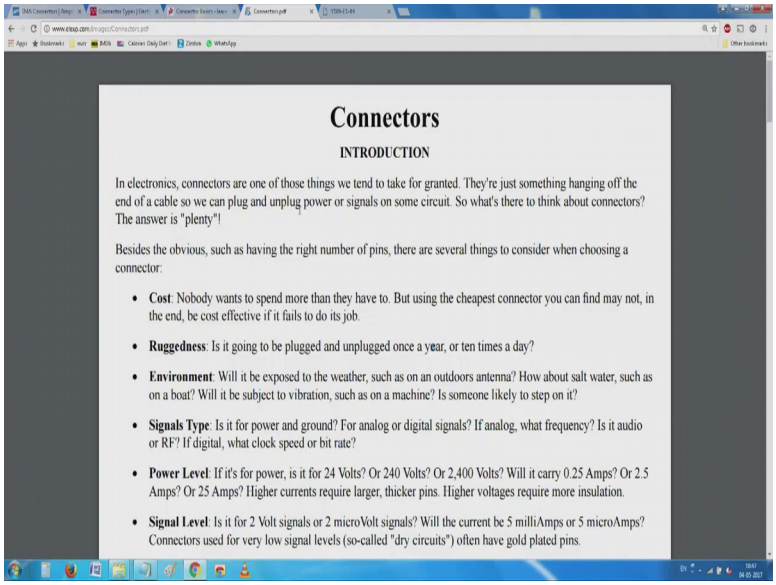

Again one more time I would like to acknowledge the trade white papers and acknowledge their copyright and that now I feel the whole thing is you know I am helping both the manufacturers as well as what you call application engineers who tries to use it, but then I cannot give a better summary than what these people have given. So, I will post this separately. I have a huge collection of links which I have just may be this morning I checked and this seems to be working.

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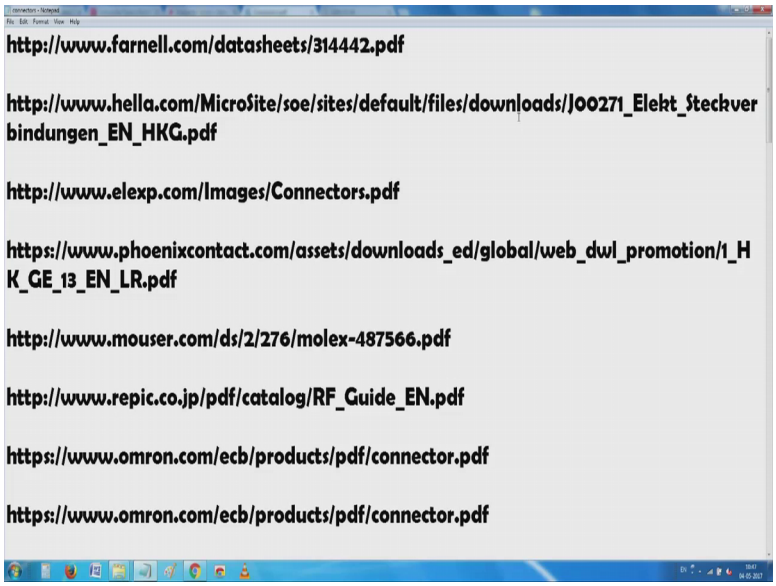

Now, coming back to a thing, two or three things you would have noticed. One of the first thing is you have the electrical requirements and something little related to this is the mechanical and then, the safety requirements, safety engaging and disengaging and in the case I mean various things, typical electrical requirements are all. I will get back to you something related to the basic voltage and current and occasionally stray capacitor and inductance and something called the characteristic impedance of it. These are all core electrical requirements. Mechanical requirements are obviously ruggedness and all non-electrical are included in this including environmental and shock vibration chatter and then, degradation over continuous.

So, if you see a contactor like the one that starts his pumps and all that, they are all made for a stated millions of operations and not just one or two and as a reason, they do not fail, not that easily unless the application guidelines are exceeded and whenever there is a fire in a building, it is very common in our country to blame saying it has been caused by electrical short circuit. Me being an electrical person, I would contest it. It is not just accidental, they later called short circuit has happened if it was a short circuit. Logically the safety devises would have tripped. This is something built on top of it typically in a house. I can give you an example.

My house loaded with I am sorry for avoiding the first person. House are often loaded where lots of modern this thing like I have that clothes press which is somewhere around

800 watts. I have this which is another 800 watts, then we have a clothes washer which has unspecified this thing. Probably it has the water heater is about a kilowatt and then, there is hair dryer which takes more kilowatt and there is a dish washer in which stated power itself is around in opic power is around 2 kilowatts, then we have a microwave which is a combo microwave which is around a little more than 1 kilowatt than we have all sorts of things and something to really spoil the environment is everything is loaded with air conditioners and refrigerators, but the whole house has only a very small 3 kilowatt connection. So, maximum we can draw is around 15 amps from the utility, but all these things if you load them together, much more than that I have around 15-20 kilowatt load.

Now, this is where some amount of what you call something has to be done to make sure that while individually we do not seem to who have any issue, together logically something should trip.