Enclosure Design of Electronics Equipment
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Lecture – 56
Integrating Products with CAD

Let me continue what or where I had left yesterday. I would like to point out that somewhere in your mind or somewhere on I choke or on a other thing you need to have things like this.

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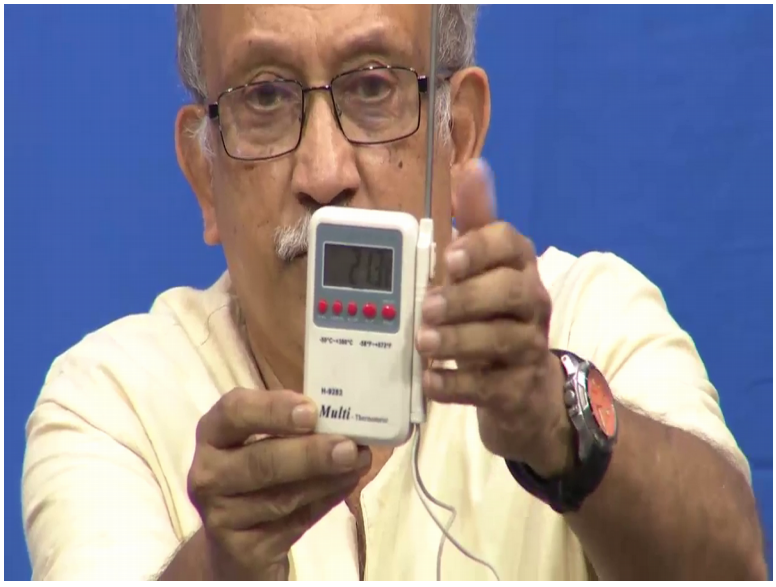

A concept I think you some of you may have understood what it is, it is a thermometer with a probe that can be removed. So, I have a probe here then I have a thermometer I am not much about what you call about the technology behind it, the technology could be it is I mean there is some sensor and there is a long wire and since you are talking about packaging and what you call making good reliable and this thing about an electronic enclosure, you need to examine as I have said prior art which is there part of it may be patented, but patent is now released as such you can do. So, you first thing one of the first thing you notice here is that this is a display, if I can have a little closer view sir as close as you can get yeah you have seen that we have a display then I have keys then there is something here and then there is something about a branding, it is a generally a generic product and then you have the what you call the probe.

The probe can be put inside even a microwave oven. So, if you are what you call cooking food and all any things typically if you have a cake its possible for you to poke it inside, but generally you are not expected to leave it inside you what you call put it inside and then take the thing hence now we have a wire.

This is where we need to pay a little attention about what is the material set is used and then how it is and so on. And then at the back a few features have been added; one of them is that it already has a clip for holding it onto. Let us say want to check the air flow or somewhere we have a clip and then added something a little related to that is we also have a stand here. So, that I can hold it on a stand, and then most important is this is a place where you need to put a single cell and due to various constraints they have given a what you call extra place for probably it is the cable and all that, eventually when it sits it nicely snaps in place that is a place here I will stop it here.

Oh it does not want to switch off I hope now it is switched off at this point, I would like you to take a look at the a few of the pictures, I went down and took of a similar equipment which I had filled earlier.

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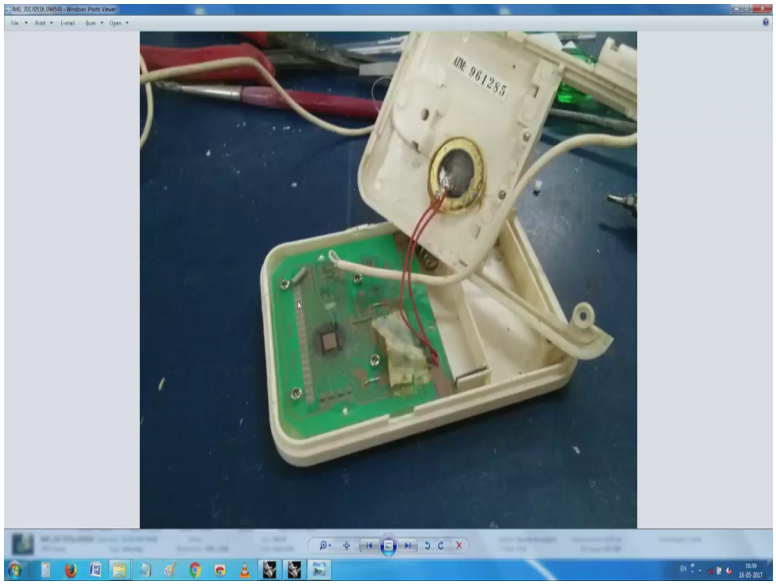

This is what you are likely to find inside when you open it you have seen this then if you see the sequence I will again get back to the beginning as soon as you open it there are four what you call fasciners and then the fasciners you know are holding at this corners oh my mouse pad is not working yeah now it works. So, you see here we have a fasciner

here, the other side does another fasciner when we open it they will notice that it comes up and one of the things you see is that you have a place for a single cell here, and then something here which will help us what you call we have a beep sound and you know things work. And all that and then you see here this is where that clip sits here understand? There is a small clip here, were the clip to be mounted into go inside this is the place we have here and then adjoining that is again now is a small beeper probably it shows if you a set time I mean sorry set temperature its sits here, and all that why I am showing you this is you see the tremendous amount of detailing that has gone inside things are expected to fit. Especially in manufacturing you have tremendous tolerances variation is there, manufacturer to manufacturer variation is there and in fact, batch to batch material to material variations will be there everything; however, is suppose to fit miraculously.

And then you see here we have some shouldering here and then we have something which is what you call shrouded there. Once we completely separate it see some other features also we see here. You see here there is a printed circuit board in which there are a row of pats which are attached here and similarly at this point you have the 1, 2, 3, 4 some switch contacts are mounted and matching with that on the other side we have these red keys. You have seen this we have the red keys, then we have a display and then at the bottom of this this one is covered by flexible (Refer Time: 06:55) material and inside now we have a contact pad. So, this contact pad operates the keys and then very important here is and why I am showing it here is a lot of times LCD is not a separate module like what I tried to show you earlier, this has a probably a small reflective pad.

Contacts ha and then that is the LCD plate which you need to just take out, there is no firm connection from this point to this point there is no firm connection it is only the pressure of this one more elastomer connector. Since they do not carry current all that it needs is a voltage. So, I have a strong row of pads here and eventually it is supposed to work the way it is supposed to work, you have seen that.

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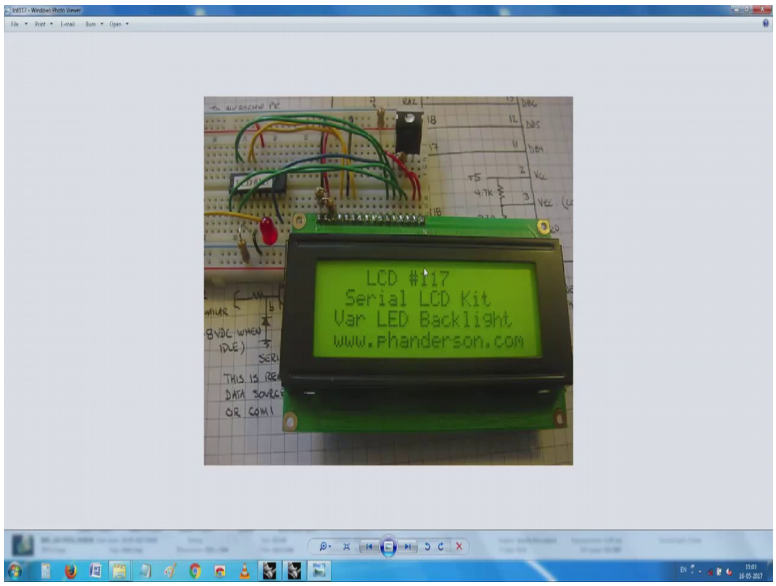

So, you have printed circuit board on which several pads are printed and then this is the device which just goes and sits there. It is slightly different from this one which I started with the other day when I wanted to show you this. Here this is a composite picture which I liked I would like to acknowledge that it is when taken from the internet and now retrieved it at this point, all the necessary things are shown here can you see here one of the first thing is it is placed on a circuit schematic and there is an LCD display, unlike the other display this LCD thing including the drivers and all is directly mounted. Inside this it is a little like what I have shown you there, in a integrated product you need to build everything, but in this case of these you need to work on this.

So, before that now we take this plug in board and then we try to make sure that the our circuit works; how to drive these circuits.

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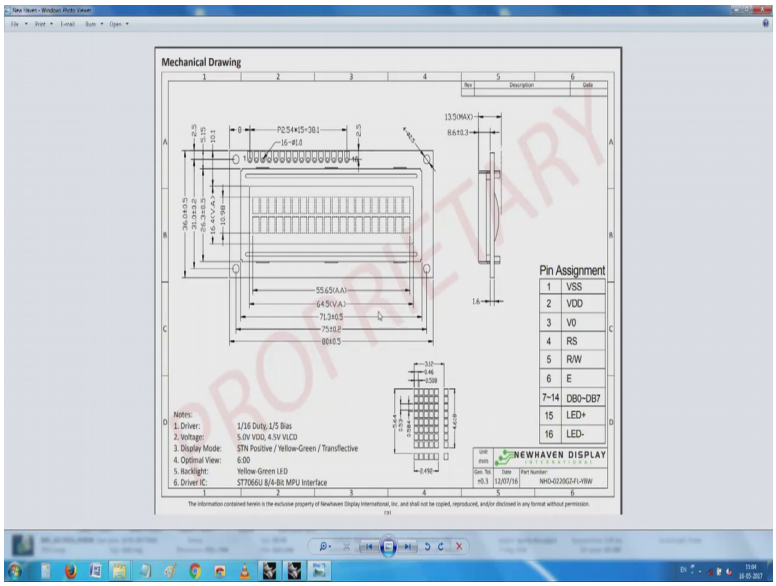

I think I showed you already. So, if you go to display catalogs, they display catalogs will give you the necessary information about hardware, mounting requirements. So, the height is 36 mm the earlier one what I showed you in the just previous lecture was 37 mm, they are approximately the height is about the same and then the width you know this is probably a 20 character the other one is different, width is here now is restricted to 83 millimeters and then you see total height, height from the front all of this are available online.

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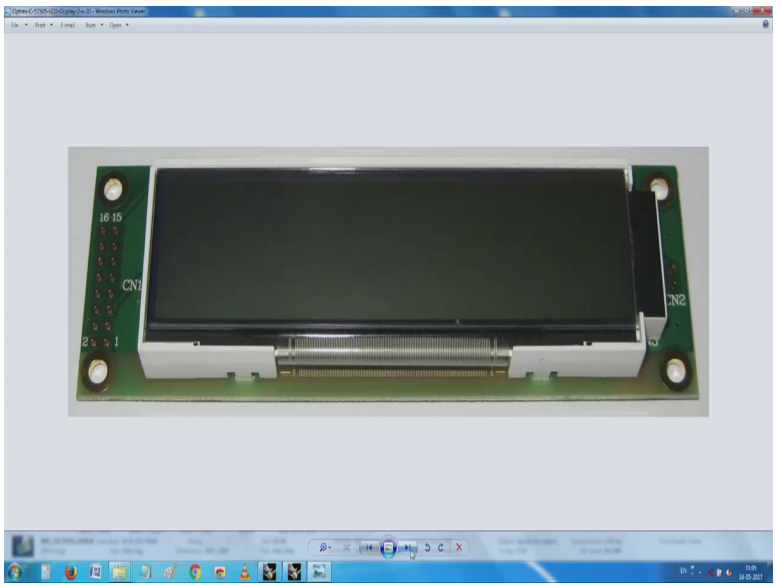

Allow me to show you because the time has come that we need to gather as much information about all the details as we have here. So, this is a I am not sure which is the manufacturer, but you notice here that we have some contacts here the mounting holes and then, see what we have here. It looks like it is a flexible what you call circuit board, which makes contact here and then makes contact here and then you are allowed to play around with it.

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So, at the back various details are there, why I am showing this details at the back is you have make sure that things do not short circuit.

And see here I thought it is about time, that we need to think about several alternatives also.

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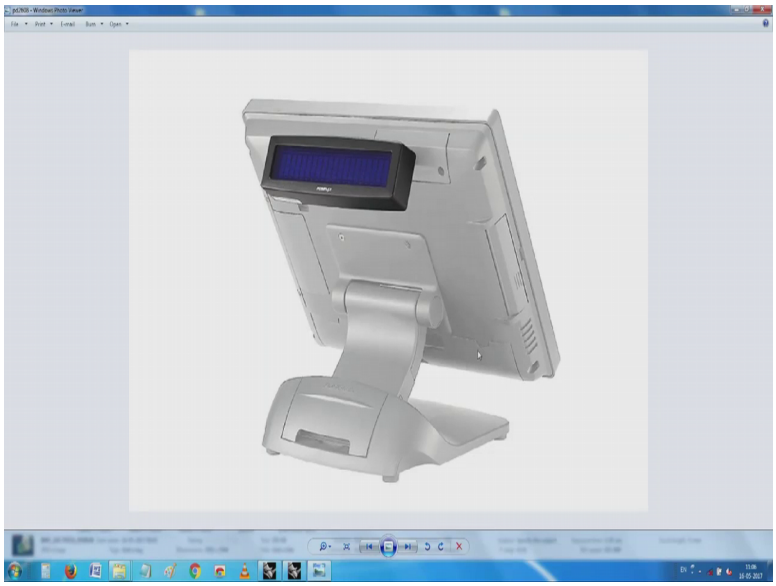

So, that it should not get boring I am sure you have gone to just allow me to go a little to several retail places, where you have a conveyer and then you have something you know a thing sticking out like this it will show you and then why do we need to have this.

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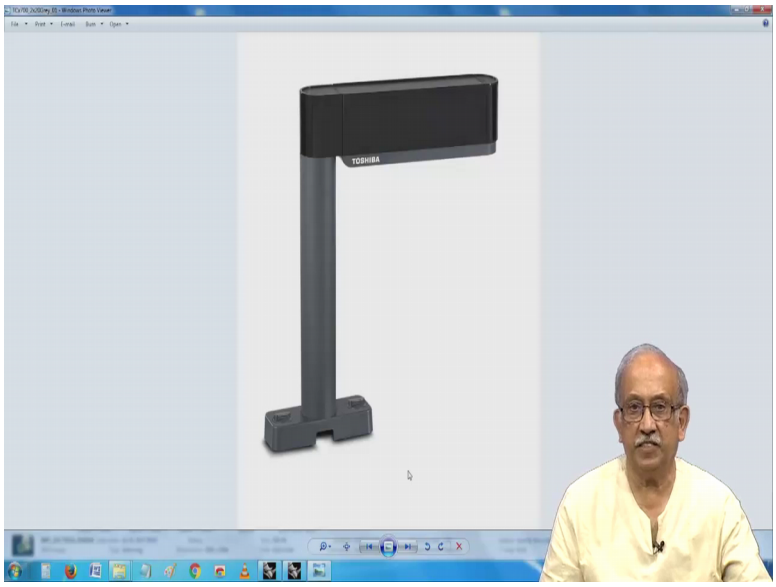

Now things with built in display for the customer is also available here. I am happy about it is now not as if now the last display has been made; These are also useful and probably at the base you have a base here oh here is it oh I have to move my hand here you have a base here you have something here and then probably there are some connections, by

which separately you can use the what you call that monitor can be done or you can use the other one also.

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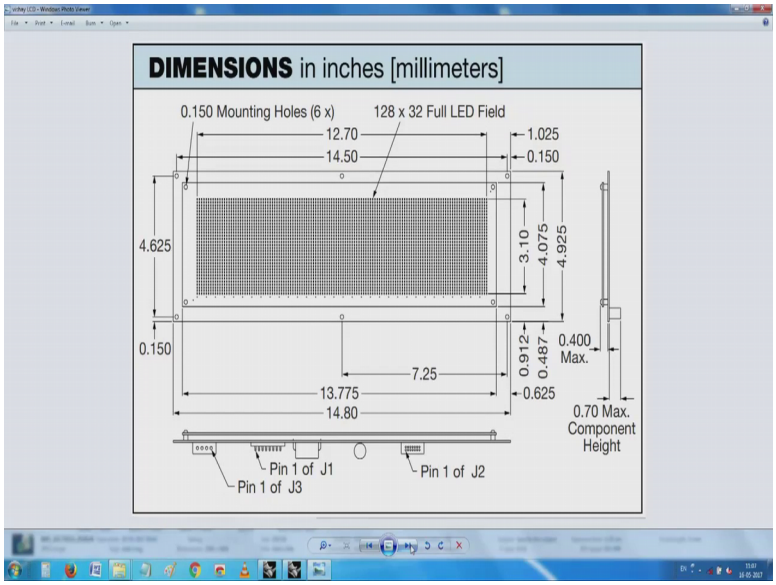

So, I think I will probably now this is one of those you know more and more of those catalogs seen this, there out too many there out there we search this one you have to find out.

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Now, it is for you to make a what you call and see how best you can fit there, I will take you to another interesting thing which I tried to show you yesterday, you have seen this

beautiful things. So, I have all this options are available for you, you can overlay sheets and you know you have keys and you have the one I have got from the thing, it will come towards the end just be patient with me a little it looks a little like.

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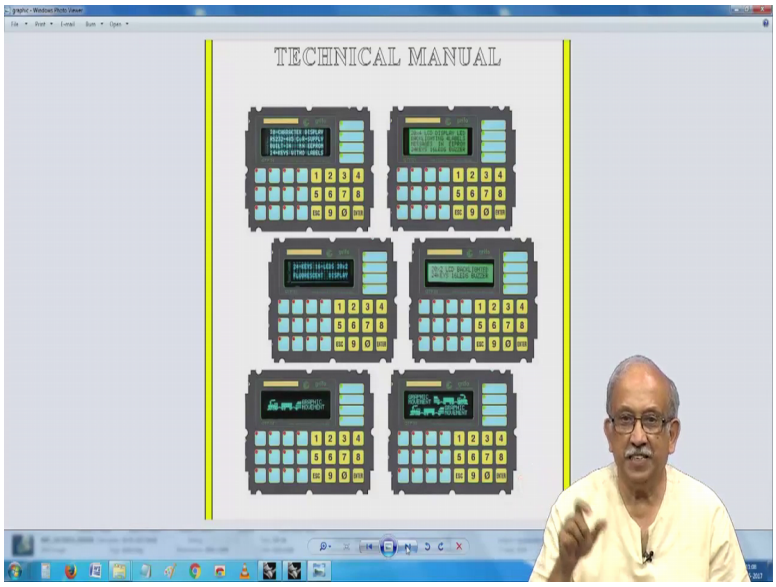

What I had shown you yesterday its part of a CNC machine. So, all these things anything you want there, there are keys here with a small LED button there which shows the button will be lighted up then you have the normal input button then you have function keys, all these displays if you can try it is available on the online probably you start here.

Now, I will skip to the actual now you agree with me starting point is that. Look at the display and then after looking at the display find out how much of space is required for us.

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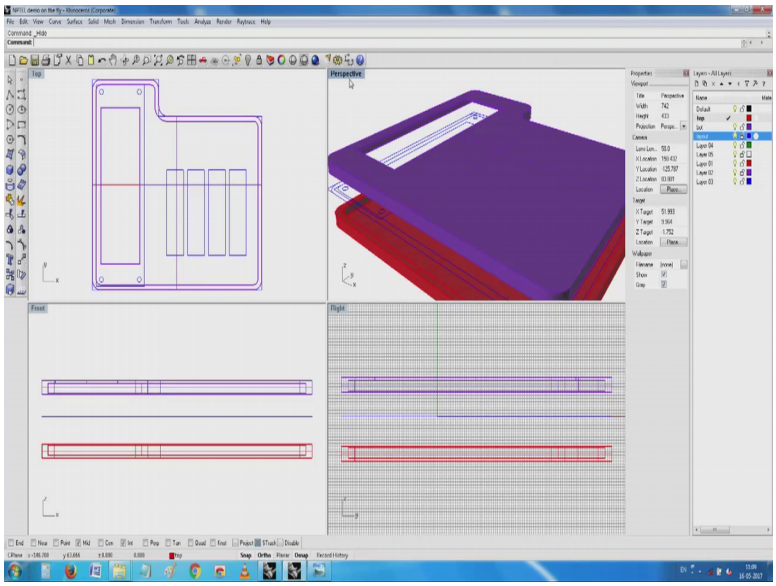

You have seen this how much space is required for us and at that point itself, see if you can organize some of these layers and the way you would like to organize the whole product. And then I would like to acknowledge that I am using one of the softwares its a student or instructed version of a and I fully acknowledge the what you call the effort that has gone into it, and then I suggest all of you spend enough time and then try to make things here. Then I have also showed you how to try to arrange these things. Said this point I would like to probably see what a beauty of it is here not impossible. you have seen this it looks quite like what I am likely to have.

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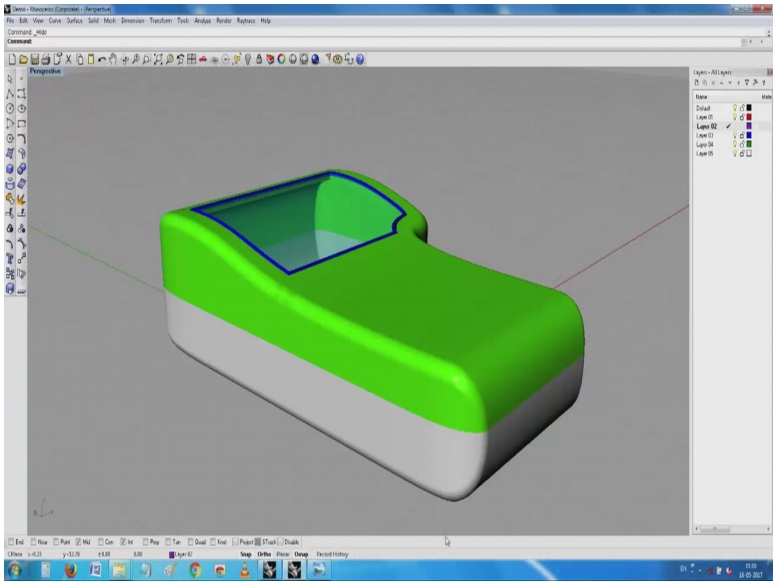

If I see the side view it has it seems to have an organic form, then I have something here then at the bottom can you see and the other side anything you want is already ready here except one thing intentionally detailing regarding where you will mount the things and all that have been avoided, because it was part of a simple shell exercise. So, you see here we have anything you want; it is for you to dream up these things.

See what has happened what I have done here is I have started with two lines in this view, you have seen this this is where it helps to have the a layer which is a concept layer. In the concept layer we are trying to attach all the construction lines will be there, after that using several techniques a surface has been created here which looks a little like a real surface. Actually this being as a simple surface modular shell command is not available you have to do a little bit of circus like what I have shown you and then what started as is simple layout has been projected into that.

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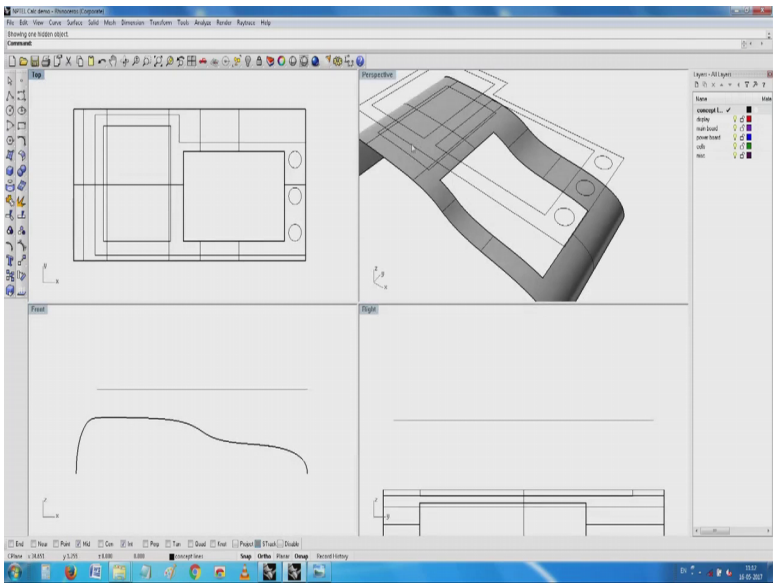

One more small has been done here, while for purposes of illustration I have shown you an opening here inside this also oh sorry, depending on the program you use and depending on the various facilities we have it is possible for us to use all the various effects that we are thinking of making it in this case, I will just show you that there is a nice command called as split command.

So, I take this surface for splitting then I take the cutting objects. I have a split surface already can you see here this is how that complex structure what I was telling you has

been made. I think at this point this much of surface modeling is sufficient for you and to make you I suggest if you are a what you call a learner student and all that, if you are an institutional student, you can probably insist to your I mean or you will find several of these programs which including (Refer Time: 19:27) semens and this one is what you call mechanical associates, does not serve this programs are available and you need to get hold of one.

And once again I would like to insist that pay for it, because somebody has spent tremendous amount of effort to make these things available for you, and this is not just advertising revenue and then most of these things allow you a 30 day limited trial, limited sales and limited trials like that.

So, once you get used to it I am sure the institution will be happy to finance this for you; alternatively maybe you can form a group and then buy one of these things because they are not very expensive. Any of these things student versions and the instructor versions are not useful, I feel I am helping both your students and the person who has made it, saying you see the power of this and this is not a hacked program. Long ago when using it for ten or 15 years in another place I have what you call got the licenses from there and I am using it.

See from here you can take off and try to decide to build the remaining model, but then remember what I have shown you is not a end of anything, you understood it is not the end saying automatically nobody can do anything with these things. We usually we start with a circuit like this, can you see this. So, one of our students is trying to assemble together, me being only packaging what I call I would not call myself expert or specialist somebody is curious of packaging, honestly I have no idea what the circuit is and what this red little thing is and then what this funny looking thing is and why, in a very clever way he has pushed another LED in this leads among LED s I have no clue what it is and then there is something else also here.

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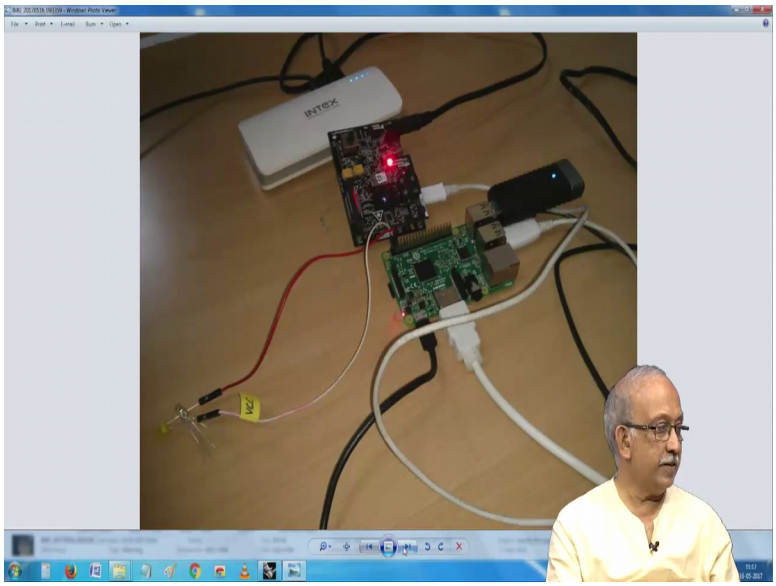

And then that is powered and I think in another lecture I told you what those are.

Slowly I think you will understand that we have one what you call circuit board.

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Then we have one more circuit board this looks like a camera, and this looks like an LED light, and then you have the main board which needs to be packaged along with this, this was made for a demonstration by another batch of students.

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So, this is you see here everything is tiny compared to what we know everything is very very very tiny you have seen here.

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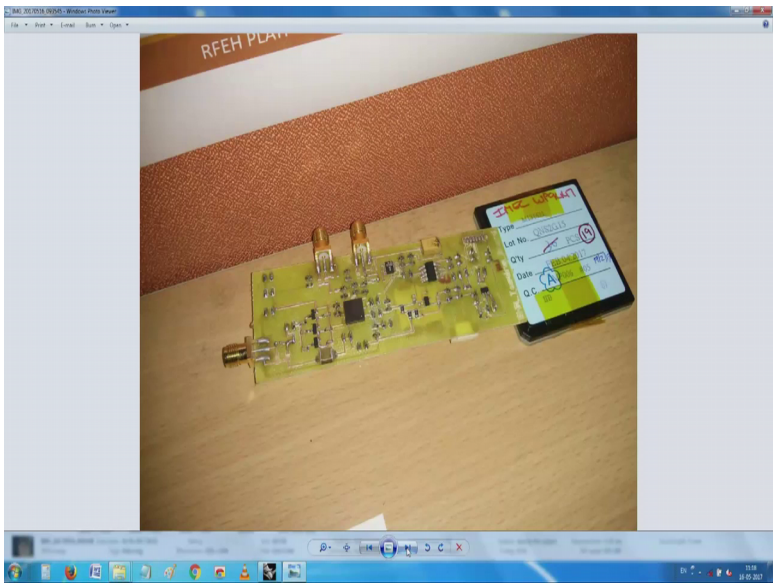

That is reality; reality is you have to work hard automatically things do not fall in place.

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Eventually you can think up of something and then try to make things; it is possible for you to run it in this machine. I think some of you are familiar with it may have noticed what this machine can be oh let me get out and see yeah yeah it did not come. So, you are happy that one was a fuse deposit modeling machine, I thought I will just stop it here and then go back again to.

A point here and this time instead of talking about the organic shapes of all the that you have seen very complicated nice beautiful shapes I have shown, if you want to quickly get it done in the in a fabrication show, you can either make it in sheet metal or you can make it in assembling together plastic sheets. One of the earlier lectures I showed you how the beagle bone people you know make all those things together, and I am sure if you are a serious hacker or enthusiased, you will be hacker means it is not the not about ethical and ethical, somebody who likes to tinker around with these things you can make them in your own place.

So, I will just start again one more quickly, I will try to tell you at this point let me stick to trying to make a simple enclosure except that I will try to go a little faster. I have a profile of a thing which looks a little like a calculator, and I will see whether I can make a sheet metal device out of this. If you again recollect yesterday's show in which I have shown you an l c r bridge and at the bottom there is a small adaptor box, which was made with two points of sheet metal we had one on the top going inside the other one

then we have this bottom one and then I am sorry it was like this because we needed to put the connectors and then some very clever way they have made a fascining for both of them. Details are not here except that approximately I know the shape and size of it.

So, I now go here and see whether see slowly concept I want in general you are speaking of how. So, I have one line representing the left and then I have one more line which just a minute I seem to have I am not able to get rid of that colour, forget it I thought I will switch off the gray colour for some reason, I am not able to get rid of it I will see right I have a beautiful empty screen here, where you can probably see these things, I will just start here which will be easier for me again the same thing which I have done in the other program.

This is slightly better seen this. So, slightly better, at this point and what I would like to point out here is depending on various constraints especially starting with the display and then the total area that is required again in the previous pictures I have shown you as a schematic somebody has tried it in a what you call genuine bread board or proto board and wish board then they have got it all working after that you have genuine estimate of what are the components sizes and all that is required. And just earlier just before I have shown you where you buy things which are already tried tested and then try to do a system design by which you try to put all the things together and then your focus is on instead of the hardware, which is already tried and proved proven and how to integrate it and how to use it for useful products.

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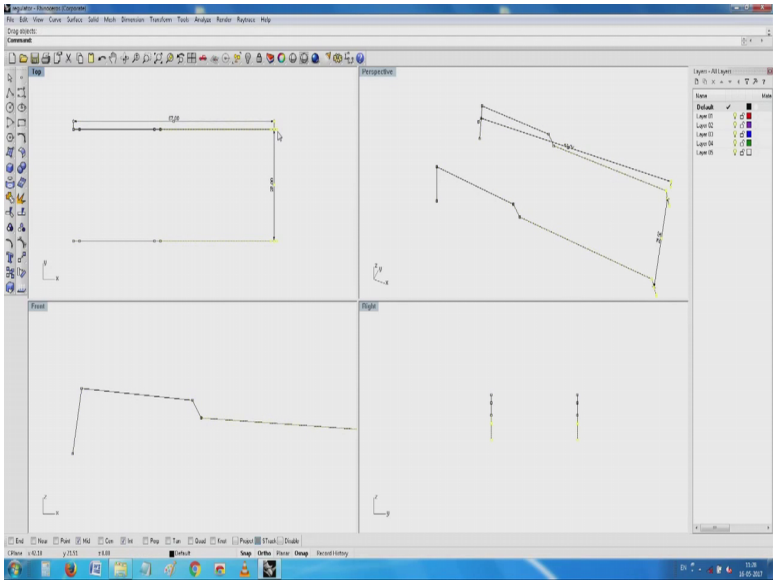

So, in this case I generally have a small idea of how big or how small the project is going to look at this point. In fact, it is in order if I can dimension these things see its small 28 m m wide and 52 m m long small tiny thing, little bigger than the temperature indicator I have shown you. Starting here now let us say from various practical considerations it does not appear to be very convenient for me it looks small, maybe I need something which is a little longer. So, I made it longer and then you see without compromising on the total length, I have increased the display area I will even make it little wider than what I need you have seen this. What started as a small size slowly I noticed that it has become a little bigger than what I need and similarly height does not appear to be sufficient for me.

See does not look very proportionate. So, I will go back to the old thing where we have started, better. What I wanted to do as I wanted to maintain the proportions I even tried to make them a little bigger overall like this then fortunately, we have beautiful things here saying I can always scale it in three dimensions. So, I take all these objects keep it here, make it twice as big oh not bad 124 by 78 parts of these things have been maintained parts of it have been restored seen this I am on the way.

Now, I need to see whether it is possible for me to convert it into a sheet metal exercise for the top version; obviously, it is going to be one long sheet metal which will come like this, which is relatively easy all I need to do is select a line.

As a small (Refer Time: 35:51) of this one trying to look like a sheet metal part. Now comes to the other point saying can I now use it for practically creating sheet metal parts. So, you will notice here is the other side profiles, and if you remember the sheet metal nowadays call the exercise which we were talking about earlier, a lot depends on thickness what thickness overlaps what and whenever you bend the little bit of empirical as well as theoretical thing about what happens to the material in the corner. So, it is possible for us now trying to oh what do I do now can I make it flat? Yes I think yes we can easily make it flat it is a question of taking all these things you say everything is bent like this I need to make it flat and then I have the basic dimensions which have come about, and then try to make a flat sheet out of it. I will just show you in profile to see seen this, oh I will do the other way instead I will go to the dimensions go to dimension properties and then try to default.

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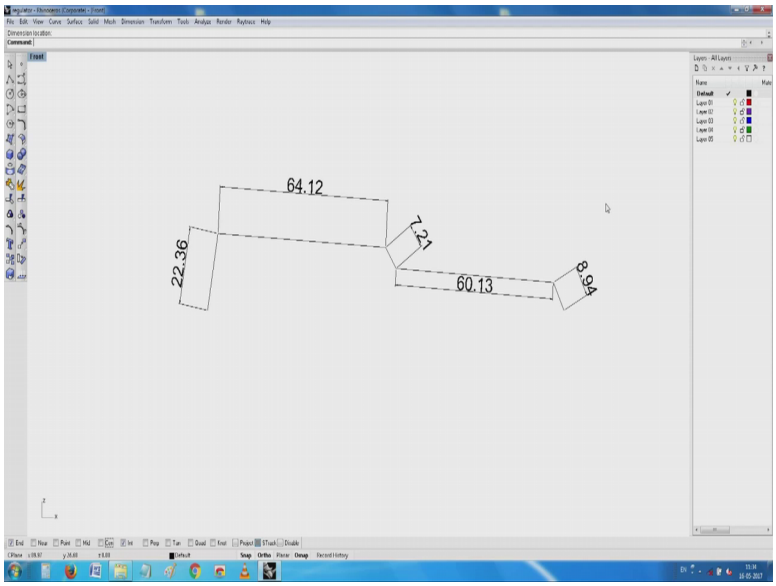

So, that it is visible I will try to make them a little bigger four times as much you have seen that is 22.36, no I am in it now once again I try to go on continuing with these dimensions very odd yet. So, it is for us when we are talking about the proportions how to decide on how to make the proportion.