Electronics Equipment Integration and Prototype Building

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Lecture – 05
Real Life Parts to Scale on a Graph

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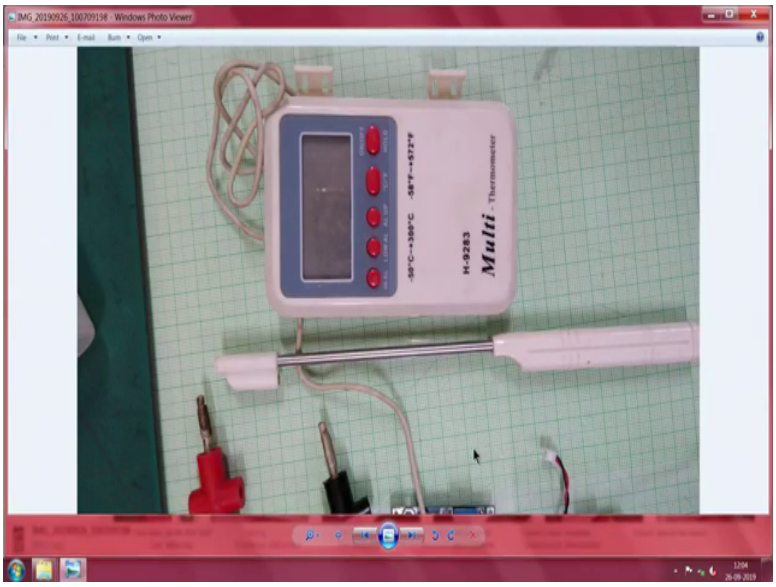

Yeah, hello let me continue where I stopped last time. Now, please have a look at the picture I have here can you see. Now, we come to several notices exotica. So, this one is a probably it is actually a kitchen and a meat thermometer now it is used extensively due to the big accuracy here. Let us say you wanted to make some other equipment, which is a little sophisticated, but use a similar thing you can always cannibalize all these items it does not cost anything.

They cost less thing cost may be around in India; know they equivalent around 20 US dollars thats around probably 2000 rupees. And I am sure if you look around you can get it cheaper. The important things you can notice here is first thing is the display with the keys. If you want you can use all the keys you will see here that some of the keys you know are not very very useful.

And the more important thing is this probe; in this case probe display and at the back there is a device to hold the power supply. You can just open them take pictures make one is to one things and that you can use in any one of your other things.

Let us say you wanted to make a temperature measurement device, which measures the ambient temperature when you are around you need not buy it you have this and all you have to do is just take it out let one part of it come out. And if you remember I had showed you the I am not sure whether its a Arduino board or that Beagle Board or whatever it is. I said some part of it may be getting hot I need a fan and then I said I need a heat dissipater.

So, when the heat dissipater fan everything is there I can probably even disable this whole, I am sorry dissemble this whole probe and attach it to one of those things and get a signal somewhere and then try to utilize it for the first two prototype model. For all this a little bit of jagglery, its enough if you just start and then go ahead and start things.

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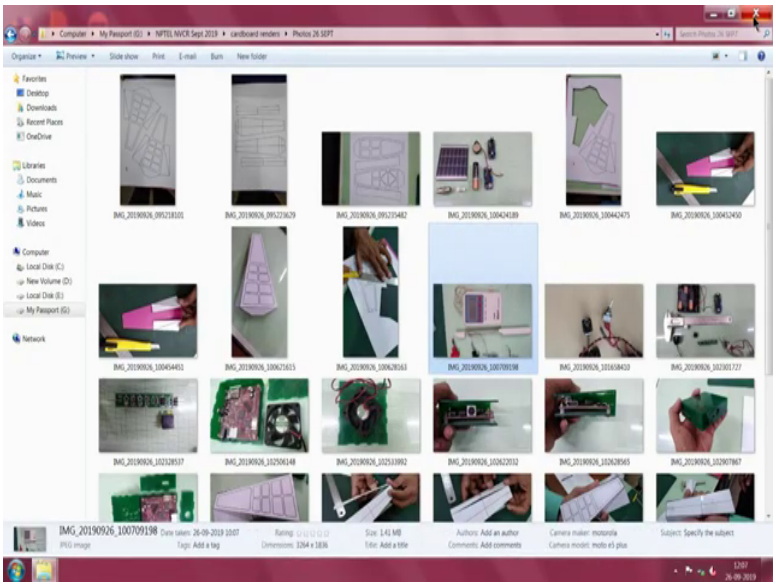

Now, coming back here I glossed over a few of the things there.

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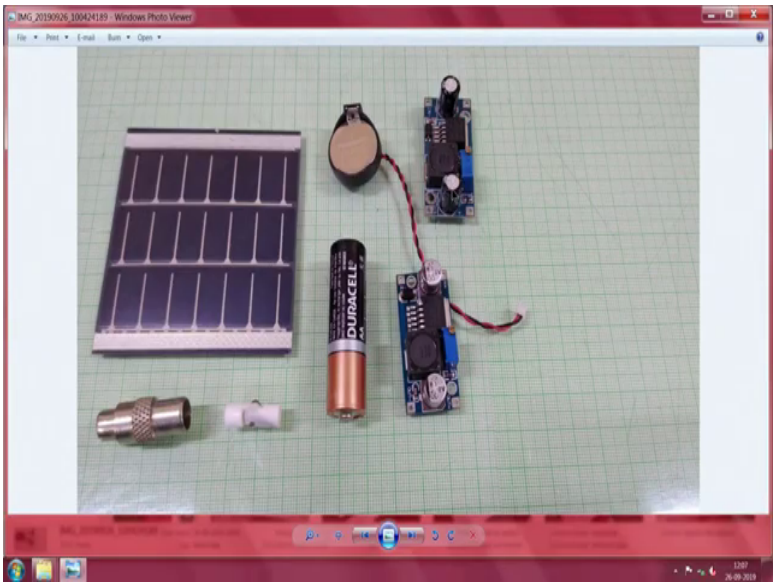

You need to make as I said a library of various components. So, standard library will have probably just listing of all of the thing as a bill of materials. Now, we come to interesting things like this you have seen. Here I am not very sure to me it looks like N connector and I do not know if it is just a N socket and plug together or one side it is N and the other side its an RC or anything.

If I have several of the devices taken from a catalog, followed know I have several of these devices taken from a catalog. I will see that when we talk about a N connector and when we talk about a TNC or we talk about a various type of thing only the interface standard is the main thing which is talked about, but the mechanical things vary a lot.

Some of them you have a flange here which is fitted to a panel and the connection itself some of them are just straight some of them have a bayonet mount; meaning you press and you lock

it inside. All these various details are not easy to pick out from a standard what you call data given by the manufacturer.

And even if you file all the drawings together going through the file and looking for our thing know looks crazy instead, get the original if you can if you cannot get the original make a drawing with all the 3 views including a 3D view; make a scale print out and keep this scale print out with you.

The moment you take the scale print out with you with all the various things which are cut there, we can instead of keeping the component there you can keep them here and happily play a little bit of how to put the jigsaw puzzle. A jigsaw puzzle is made such that know one piece does not go into the other place; even if it goes the whole scene will be wrong. So, you have a reference in and you put inside symmetrical jigsaw puzzles most of the pieces look same; however, starting from 4 corners and some reference you can (Refer Time: 06:01).

In our case, our jigsaw puzzle has multiple scenarios which it can project; I have a scenario in which some of the devices are in one corner or I have just shown you one photovoltaic panel which is flexible I have a flexible photovoltaic film. So, that flexible film can be either made like this or it can go on top of it or if I had shown you the what you call remote control why not have a photovoltaic device, which is directly the when you leave it on the outside of the table on a flat surface it can happily.

Wait my hearing gets, you can happily allow it to charge all the time you have seen that what looked like a small photo film is a full fledged flexible photovoltaic panel. Now, I have all the latitude available for me for rearranging all the things together pieces of the original jigsaw in some other way by which results in a completely different product. The product may be generic, but my calling this instance I can claim an IP on it.

So, I am sure you too would have seen JBL charge to what you call players and all that there any number of clones are available; but we know a clone is not as good as the original, but at least in the picture things look same. So, it is with the 3 apples I am sure all of you have heard

about the 3 apples that changed the thing know; first what I call called apple in the garden of Eden.

And then the next 2 apples I think all of you people know they poor thing which fell on one of the scientists and lastly one entrepreneur who changed the way we think about it. And you will be surprised even when the first apple competitor was made the whole thing was assembled together using foam core boards.

The design was done like same thing with HP and eventually even now see a lot of mobile these things and all applications. And if you have can you easily be simulated using your home printer what you have at home. So, let me quit this thing and then try to get back a little deeper and see what I have here yeah? I think most of them I have covered.

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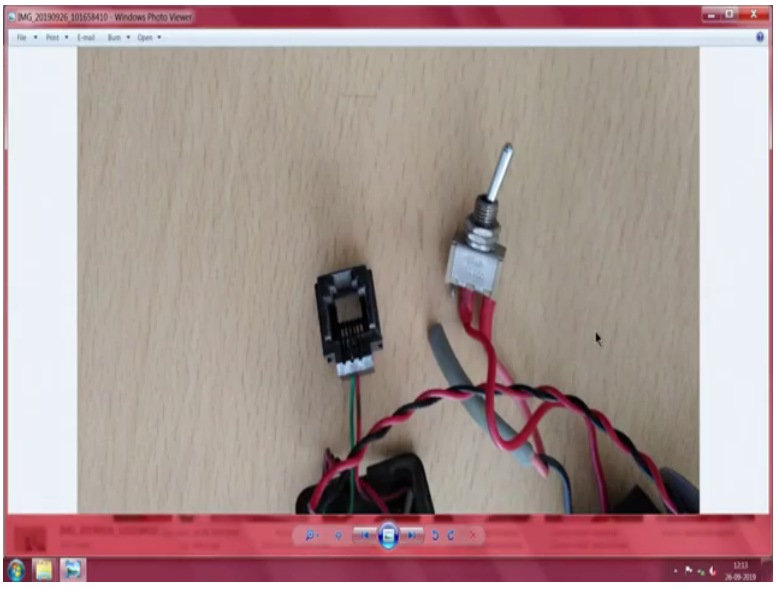

These are some things which we had are had to love you cannot get rid of an a an equipment without a switch of some sort and sadly neither these connectors. Well, there I spoke to you about a type and co axial connector these are the unfortunate connectors we end up with the computers unfortunate connectors. We end up with our phones that is our 6 and 8 pin RJ series of connectors.

And they occupy space and while they connector interface itself while the interface itself has been standardized what goes in and the way it takes a turn and where it sits on the printed wiring board and how it jots out. Does it go into the printed circuit board or does it go into the enclosure and how is it wired do we end up with all this funny type of wiring. And this horribly colored stiff things coming everywhere and then we have something else and finally, what about all this hardware.

All this of course, I also understand that works best if you have it actually in 3D; but getting it into a shape and getting it 3D printed in economical way is not easy. So, I can go back to the that 3D what I call I am sorry a printed thing.

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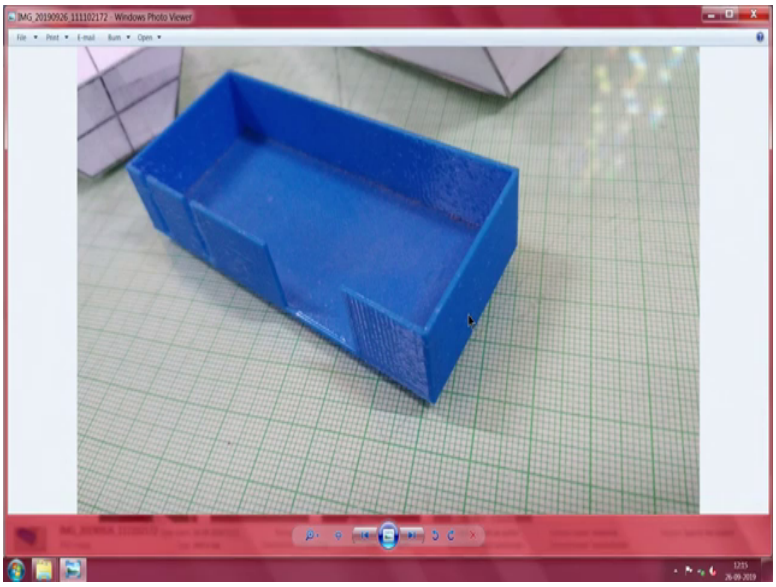

Now, see this here something have you noticed first of all, we are forced to keep the prints vertical the layup process is vertical. And due to some unfortunate this thing if you attempt to close all these things. And then you end up with a problem of how to either assemble the circuitry inside or the printer usually has a buildup material and that a lot of time is required for you to release the hold and holding and support material inside.

So, what looks like a very automatic very easy way of you know converting why do not we just do 3D printing, why do not we just do laser cutting and all that still has serious limitations and all of them have the main final thing of having to design very very carefully about it.

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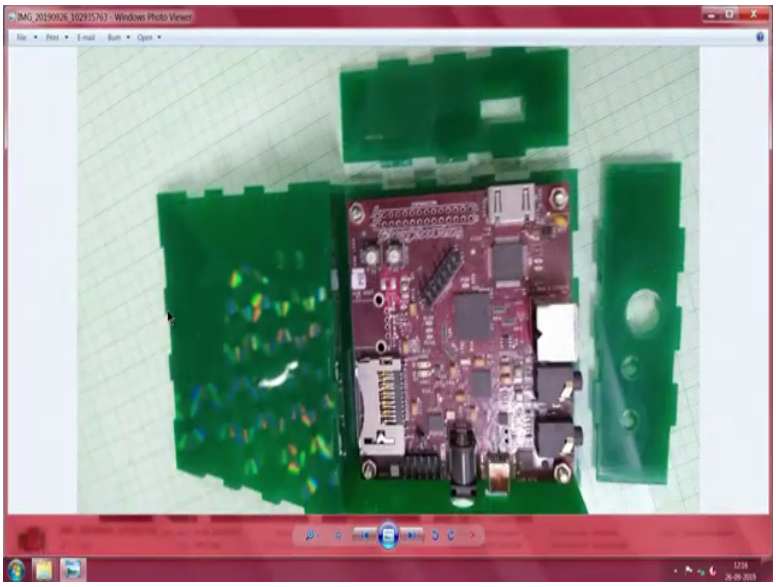

While I have talked to you about it now let me get back to this again this sheet. You have seen this it looks very neat it goes (Refer Time: 12:23) here and everything looks hunky dowry; I do not know what it means how do you pronounce it pardon me for the this thing heavily accented.

What you need is you will notice here there is a thickness of this material and that thickness of this material seemed to be critical in determining; what is the depth of this cut? If the cut is more than the thickness of the material it does not you know stain somewhere other there will be interference. And the depth here is not completely mesh to this; you will have a item which is not as neat as it looks it looks neat that is all I can tell.

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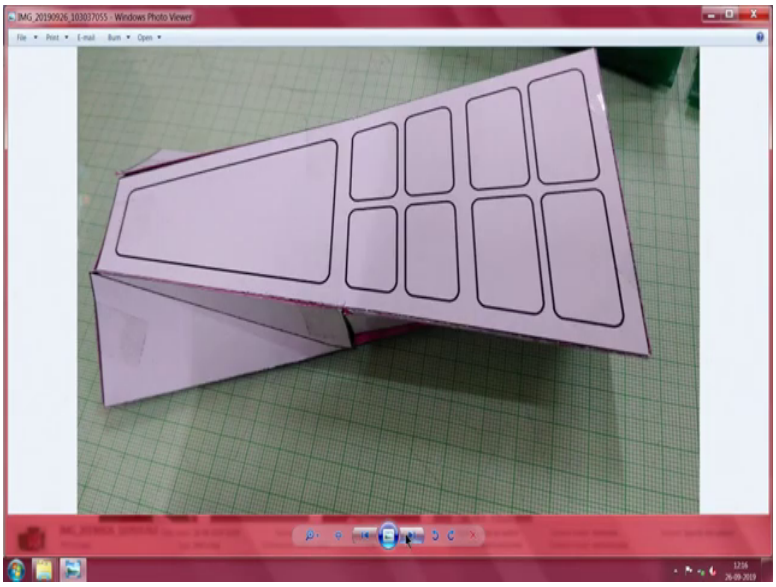

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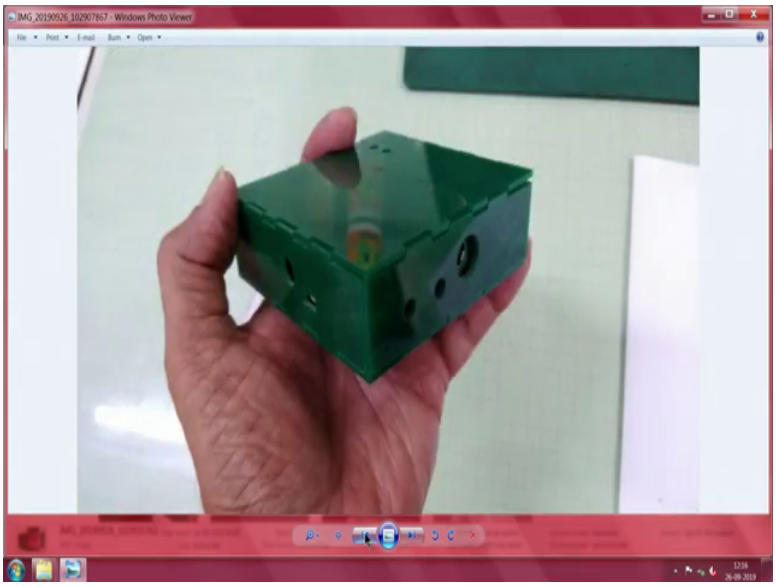

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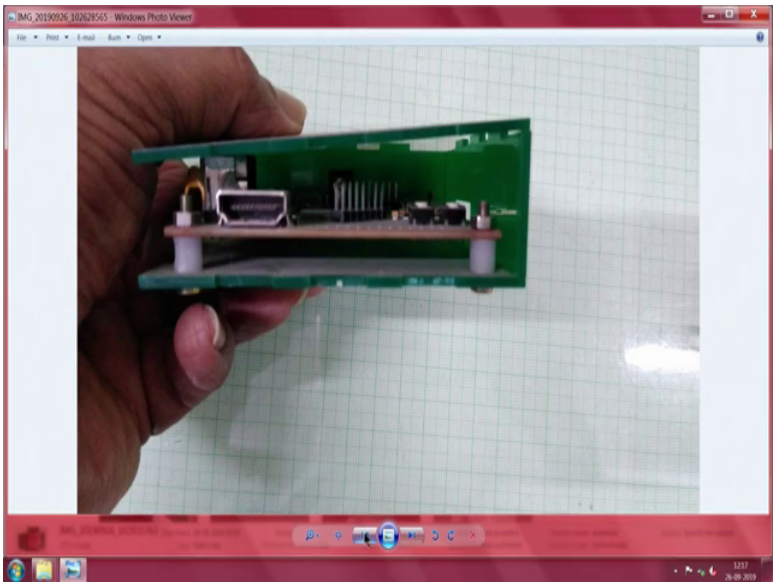

In the hand it looks neat but you will see here, it does not really sit that well as we imagine it does. It does here intentionally, I mean my colleague is holding it he has made it pop out and sometimes we do the mistake of building a dovetail into it. You see the problem, let us say I tried to make a dovetail, I think those of you are typically woodworkers would have noticed how dove tail sometimes leads us to a problem a dove tail works best if both of these are on the same plane.

Otherwise you cannot have effort to have a dovetail with only straight cuts, I can have a dovetail here to match the dovetail here this must have a slope here. So, you end up having to probably print these things separately and this as I said I was trying to tell you about it know I have a dovetail here.

So, one of these usually the projecting part will have a taper this side, now corresponding to this I have taken a taper here. So, I have to make this equal to this width and then afterward take it out and fit it manually; file it and try my best to fit it once the dovetail is in place then the whole thing is stable. Right now this is not in a very stable state if one of them is disturbed whole thing will pop out. For these things still a little skill in model making little skill in thinking forward is needed and all things can best way done if; first time you make something on a small scale preferably with the resources you have here.

So, we assume that all this know nicely is centered looks nice is it not we have something here, we have something here and might like goes here and this thing. But first thing you will notice is things do not automatically centers themselves. We would have ignored thickness build up here and this part may have got its datum referred to somewhere else. And the printed wiring board in which the components are mounted may have had a different datum with this.

Usually, a on the z axis there will be an error sometimes up to a thickness of one of the sheets. All these shortcomings can easily be worked out here and even if you give a file to somebody and by the time you come it comes out you will notice that there is a error. And you will be thinking oh I missed it and you are back you would have sent your file here you got your job back.

And then you will notice that oh I wish I noticed it, then other option is like what I mean suggesting is, make something out of with your normal printer put it on a cardboard the whole thing. Now, pass it on to a next level of a serious hobby is so, concentrate on packaging or give it to the model maker who will understand what it is you wanted.

So, if you look at my thing here by experience I would like to tell you that there is a little recessed we are feeling very pleased about it that is a little recessed. Then, we have noticed that matching plug does not go into that opening as a small something is blocking the way, because the interface has been made a standard but not the hardware. And that was made such

that, when it is flush or with a specified gap of point at eight mm everything sits comfortably inside. So, we had to redo the whole thing. So, it does; it does take a little bit of time.

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And this of course, is I expect the student was very very keen on making a thorough job of it. So, I am little happy and he or she has gone to the thing saying I will also give a round edge here because its easy for me to do. So, I am happy now this can easily be probably know you can take pictures of it and post it and the other side manufacturer will easily fabricate a piece like this and get back to you.

A near perfect fit, a near perfect but while we are quite happy the way this whole thing has come from the shop. When we had to use it we found that there is a small misalignment and the trimmer tool screwdriver or something what we had was not going in easily in that. So,

then we thought oh I wish we made a hole bigger and so, on like that no this thing can be sorted out it our level.

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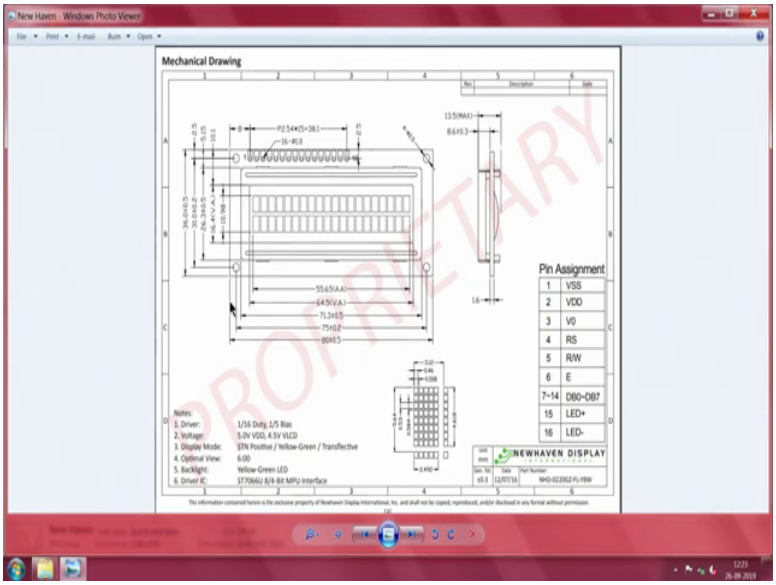

Now, I will try to go up this is the drawing of I think its a 2 by 20 backlighted LCD display. You cannot really make out much by looking at the drawing; I know there are dimensions and added to it to if it happens to be a generic drawing saying we have 2 or 3 variants in it you will notice that.

Sometimes we are expected to look here and then look at a table to say which variant is what is we needed so, many of these things you know and then so, many stuff is there saying and so on. Imagine now if you had to take a printout of this, make it one to one you understand know take a printout make it one to one probably even laminate it and keep it along with your

thing. Anytime you can move it around on your a layout sheet and you know where we stand. So, the actual display is probably this one where is it where is it, yeah.

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This is where I thought I will add the thing. So, if we can get an actual display or if we can find out from an equivalent thing and you can make a just make a copy of this scale it if required. And very important feature is the alignment of the visible window to the with respect to the mounting holes. If you have all these things two things you can do this whole thing can be used directly on.

Your computer's screen where arranging things later on to be on the safe side. Because we have two tabs here meant for soldiering and I am not very sure what is it at the thing most likely it is a driver which is sitting on the other side, this may be some power supply this may

be the thing which is required to connect a port to drive all these what you call dot matrix display.

So, even if you have to make the full thing in a full fledged 3D software, you need to input all these details and our bad luck is if its a generic display. You understand know you got it from one place which is generally somebody will give you a compatible device. Compatible device often either the mounting holes are compatible or sometimes only its an electrically compatible device.

Saying if you connect it to that particular card or another what you call display driver it works mechanical things. There is always that small print on it note improvements are possible and we are continuously improving the product. When you are trying to continuously improve the product first thing that goes where I tosses the dimensions. So, going out you remember I just showed you that ha I am here.

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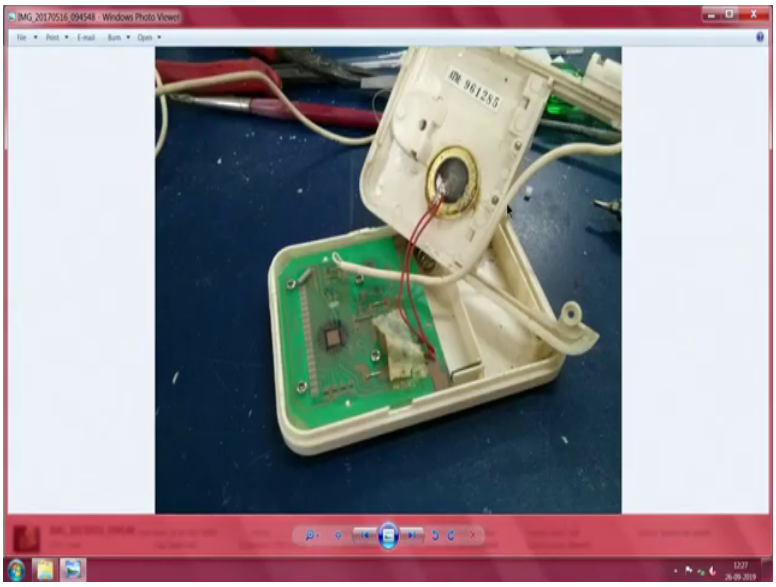

I am not sure what exactly it is, it is probably that same thermometer why I am saying it is a thermometer is, you will see here this is the side of the case where it you know plugs in here. And then this whole thing is the top of it and then most critical you have seen here, after everything is done still there is a long cable here; because this particular that probe probably needs a 4 wire measurement. And in the case of a four and then added to that it is a coaxial element. I do not know whether it is actually at the tip of the probe they have a pn junction or its actually any of the thermocouples and so on.

And this is where the display sits you have seen that know and display is having 4 mounting holes. So, what looks like a very elegant nice product once you open it its not I cannot say its good or bad; but still it has a bit of you know uncertain things around.

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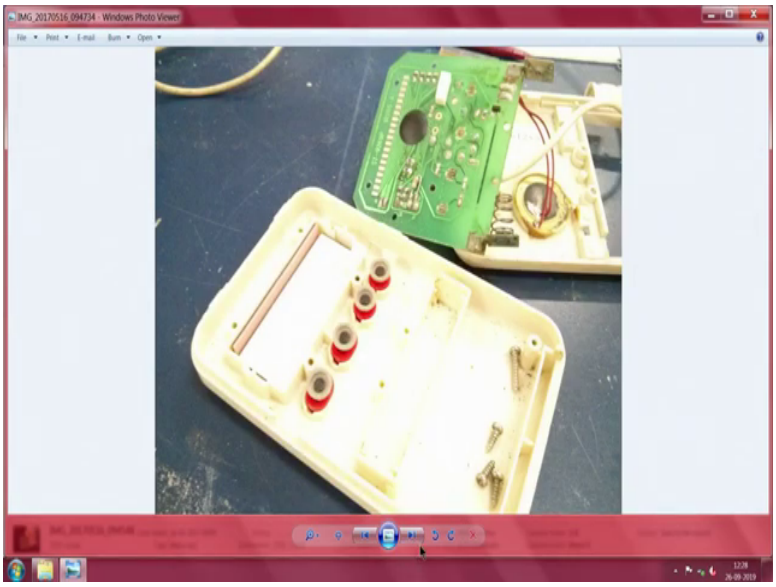

All these things can probably be made out easily. Now, you see here, this there is the connector and then we have a display and then there is a very thin this thing by I do not know how it makes a contact it goes and sits there and the power is taken from there. Most important is this is a very ancient way of and an inexpensive way of making buttons. So, here we have 3 I am sorry, 1, 2, 3, 4 contact arrangements. So, you have one either high and low or a and b and then we have a elastomer contact and the whole thing goes here.

So, all this thing will probably be easiest if we can try to make things at best as you can; once it is ready then the mold maker or the plastic designer can improve on this seen this. So, we have something which is holding together and I am sure what most of us hate is probably this spring and something very you know very unreliability which is you know put here and then there is something else here and then this plate.

This is the usually the positive has a dimple here then the negative portion has this spring; because a small variation possible. And this is the tricky part that whole thing is supposed to go here simultaneously matching this display this keys and all that. So, that obviously, is a specialist the packaging person's job.

So, while these are very what you call sold in large numbers at a low price most of the projects which you do probably take care of this by taking a display from somewhere and probably a keyboard. And generic what we call microcontroller type of a device some generic power supply, arranging all the items together and later on at the next stage now you can go to the person who makes this things.

So, I think it is worth it if now have a look at this thing, not easy know this big black blob is the actual processor which seems to do everything including, take a measurement of the device wherever the tip of it. And also parse the keys here saying what is it that the keys are asking you to do and eventually display it and it has other various other things. And things we do not like at all like there is a buzzer here, there is no simple way of connecting that you know the buzzer to this ha.

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I showed you already ha I will get back to it nothing this is the what we call the 3D printer what we have.

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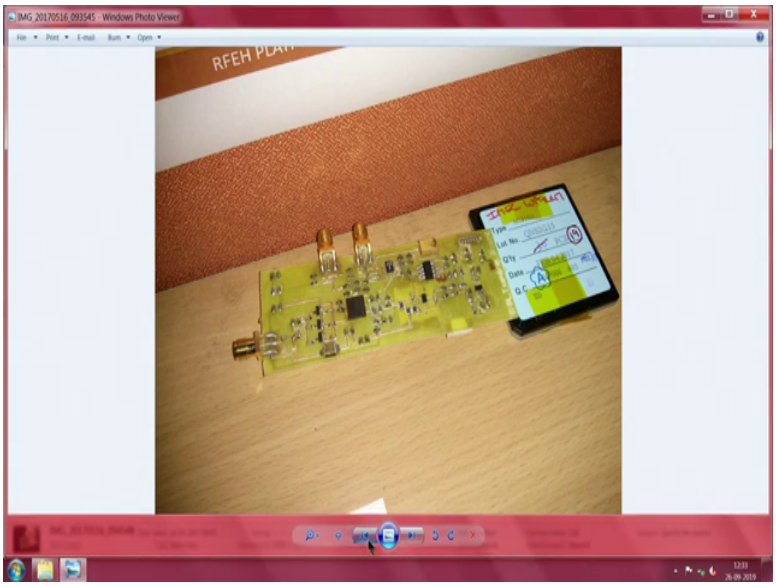

I thought I will show you these things, these are typically RF and microwave devices. So, you will see here there to use special type of connectors this is probably that SMA type of connectors. And we have this thing say another problem in this places here is, the moment we are going at microwave frequencies layout is extremely critical and you end up with multiple antennas.

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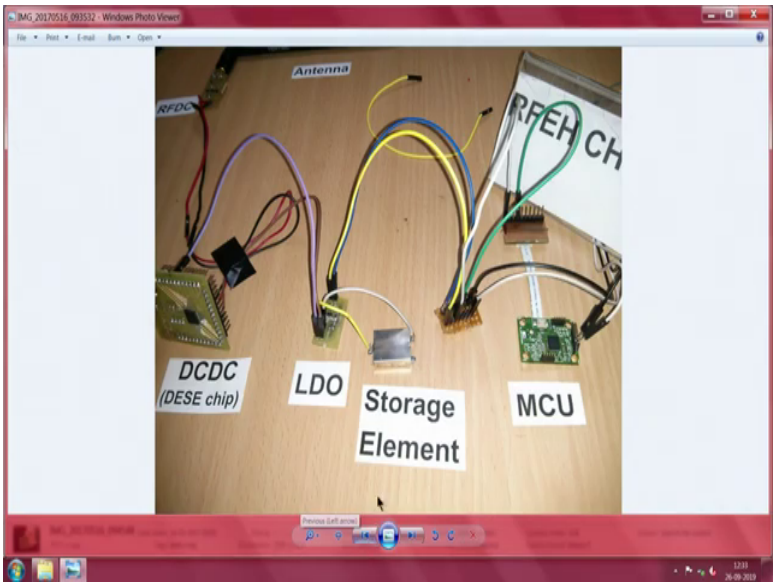

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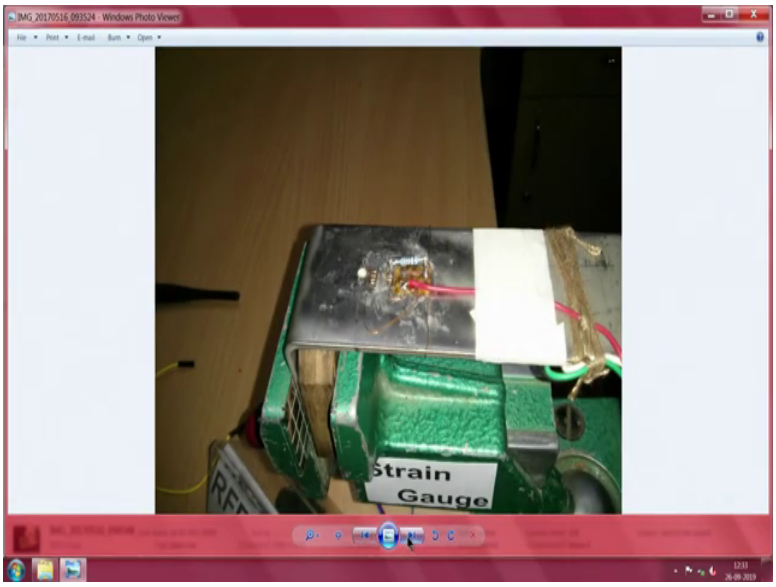

And then seen this know you have so many of these all this stuff which goes around like this ah; nothing that is a load cell and somebody is trying to demonstrate. Seen this, something which is very very interesting and important for you to note.

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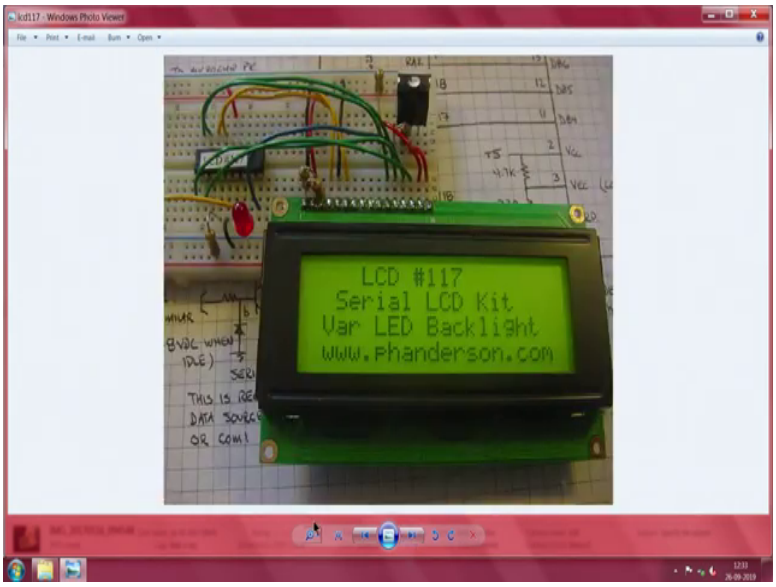

Especially if you are one of those electronic technical people, very carefully they have shown you a breadboard probably it is the old wish breadboard. And saying on the breadboard you have this many interconnections and so on you have a something which is shown here I am not sure what it is. And there is a with a variable LED backlights; meaning you can increase and decrease the thing. And the most important thing is the whole thing is printed on a, you have seen this background is a school block book. So, you have a circuit diagram here there is the main this things. So, you can see probably V cc ground and so on.

And the whole thing is neatly so, we have a basic schematic diagram converted into a working what you call circuit and finally, it is driving a display. And all these things in this case know because there is this seems to be only on how to run the display. Various types of sensors, inputs have not been shown here the sensors and inputs and you know

intercommunication to the outside world and all that know I have not been shown here. So, this is how exactly are things gone. Now, I will get back to a real life product.

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So, what could this be? I am sure, you may have seen this in at various shopping places these of course, is taken from the display persons thing. So, you have as part of any product obviously, you have all this and it is not your business your business is only trying to make the display in this case it looks like the customer end display attached to a cache register or something. This thing is a very very easy for you to go ahead and try to make a first model and then go and you can make a presentation to somebody and you can probably get going.

And if you are and if they time for idea has come right, you can make a unique product which has your own IP and probably you can get a design registration and make a presentation to somebody who will take you to the next level because finally, everything involves scale and

everything involves a niche. So, if you find a niche and if you find that your product fits in to this, before you commit huge amount of resources by way all that those things I do or make a very crude thing.

Saying, I have all this in a shoebox and then I will show you not many people will be impressed by it. So, I am I wish you that you know you get into this I will stop this particular presentation this time at this point. We will go onto a new topic next time so.

Thank you.