**Enclosure Design of Electronics Equipment**
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**Lecture – 45**
**Connectors part 2**

So now, let me come back to your choice of connectors and the display here.

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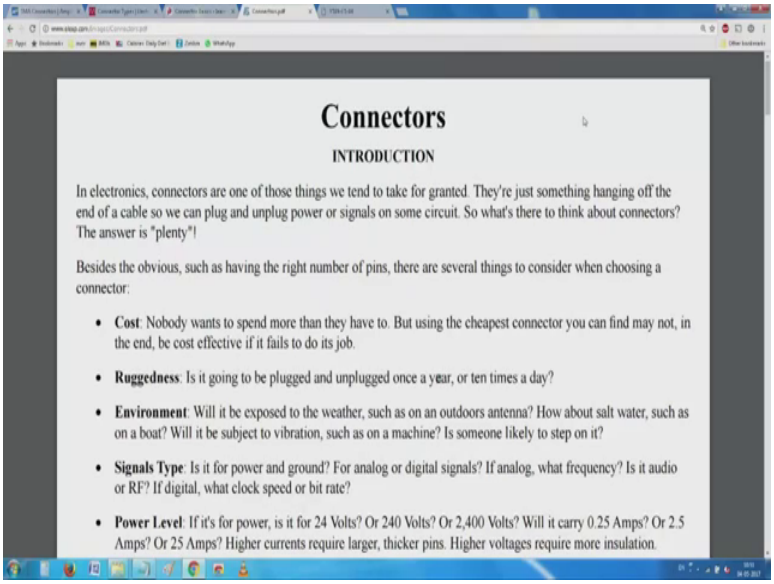


First thing is cost, what all you want now including intelligent connectors will probably built eventually. Then you see here nobody wants to spend more than have too using the cheapest connector not cost effective it fails today it is job. Now what is it is job is the main thing.

So obviously, if you go down you have so many of these things.

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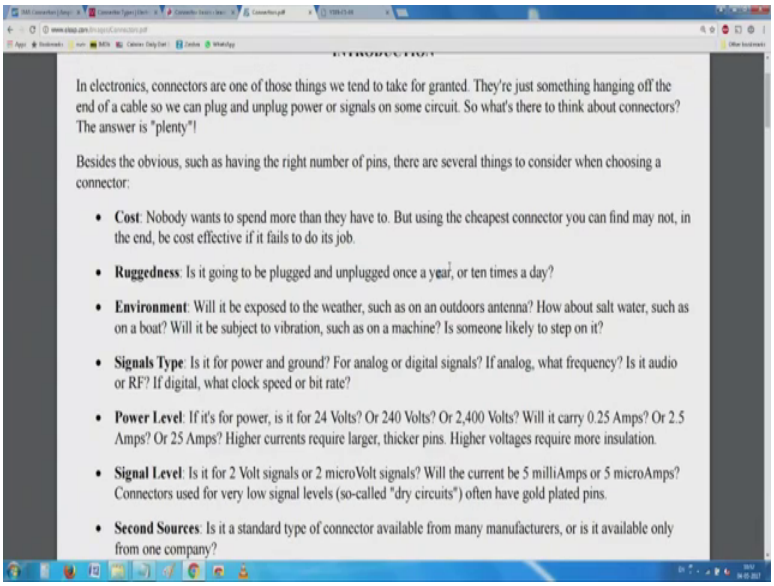


It starts nicely that is a reason why I also wanted to start with the power connectors. Ruggedness is it going to be plugged in and unplugged once a year or 10 times a day. So, I think now you know the game we would not think that you know we use it that often, but actually in reality you have use it quite often. So, there is nothing like a connector which is just you know connect it and leave it if it for such a thing like that you are probability use a permanent terminal block that is there is a (Refer Time: 01:24) you put a lug and then you tighten it and then when you want it you must open it and slid it out.

Such things are operated occasionally, but any other thing where you need to push look lock and unlock takes huge amount of trouble. Number of operations are very, very high. So, first thing is because it is written from a non electrical point of view environment will it be exposed to the whether such as outdoor antenna how about saltwater subject to vibration and a machine someone likely step on it.

In the case of our things like, the telephone handsets a dangling settle dangling test is carried out, saying if I have to hold it and then try to.

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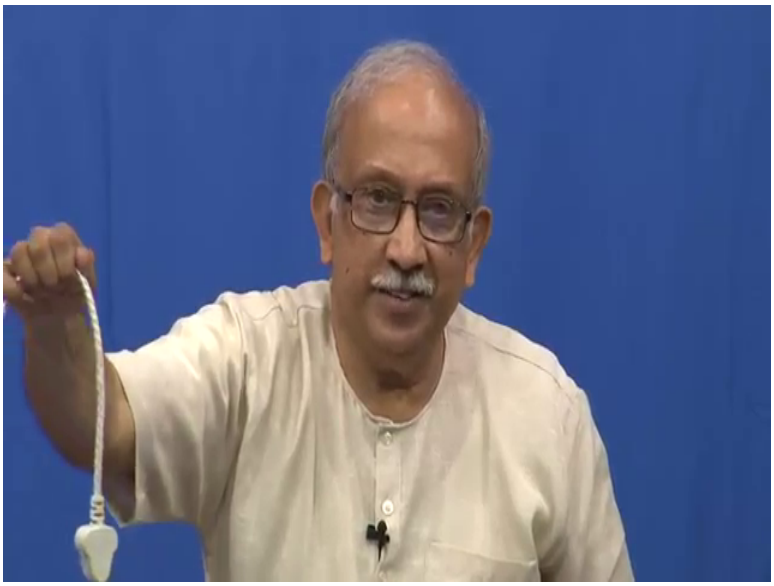

Imagine this is the headset I mean sorry, the handset likely to fall and so on, and all that no and similarly what if tresimi public are a public thing like your coin operated telephones. You would have seen the way that cable is attached to that, except what you call determined vandalism it can take everything else normal if you are not set contact. In fact, it probably electrical circuit and the other thing no including if you have AGDT tube or anything failure of that occurs much before failure of these things, but mind you it is not 100 percent vandal proof. It is determined vandal like a determined crook anyways going to get it So, I leave it.

Important issue is this environment and ruggedness are the ones that determine how big or thick or additional, what you call, extra cost we get into this.

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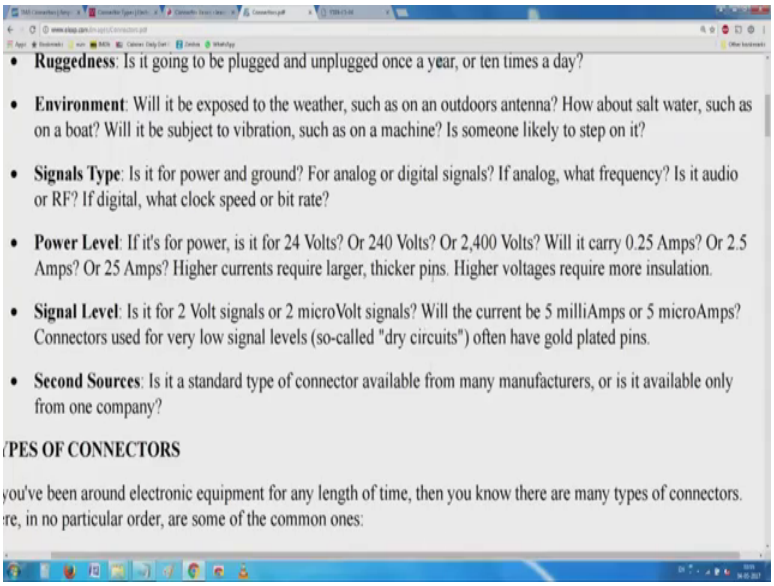


Now important is Signals, you have seen this, is it for power? Power and ground analog digital slowly we are getting into very unsafe unknown grounds. Frequency is it simple audio advantage of audio is advantage disadvantage you can make out it is hum I said you can have 50 60 100 and 120 or some. Anything above around 20 kilo cycles is normally not persuade by us. But then some of us can make out if you remember the world monitor had a 13 kilo hertz what you call raster generator in transformer. Several people were getting irritated by it. Say in a TV set you stay far away it is a problem plus together it is a problem.

So, in this case frequency one is how it affects. Secondly, the radiation and the pickup which causes it. That is the one that causes the problem. We are slowly coming into voltage and power. Voltage is the one which determines the insulating characteristic with; if it is a current the current carrying capacity or the conductor provisions operate on this power level.

Loosely if you say there is a something for a one kilo watt heater, if I say this plug is meant for a one kilo watt heater it only makes little bit of sense.

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Seen this no, now you see something new very, very unusual about it you see there is a small opening there. And there are 2 pins here. I think if you have used it you know why it is that they have provided that instead of making it like the other one which is our standard. Even here know lot of care has been has gone into making this. One of the reasons I bought it here is this.

One part of it is this is the spinster approximately compatible about the diameter everything. But this is the safety feature which is very, very critical. It will only get power if it is in a (Refer Time: 06:32) to if it is in a (Refer Time: 06:36) to contact like this only after we put it inside it will take power. And first thing is some of the things are so made that you cannot push it into a normal token this thing.

They have made enough provision to make sure that it does not go into a simple to open sockets. So, there is a 3 pin probably it is a (Refer Time: 06:56) or some other European thing. And this is an ancient thing which we have acquired, which you do not see anywhere except the jewel and the crown. And the empire where now they sun never sets on the empire; you know what I am talking, when they have switch over to flat contacts which why pin type of contact coming type of. Coming back here higher currents require larger thicker pins higher voltage require more insulation. Signal levels is it micrometer, milliamps, microamps need to have the contacted rated properly. Seen that know in this

case signal level there is it could be par level as well as signal level come to can we get a second source.

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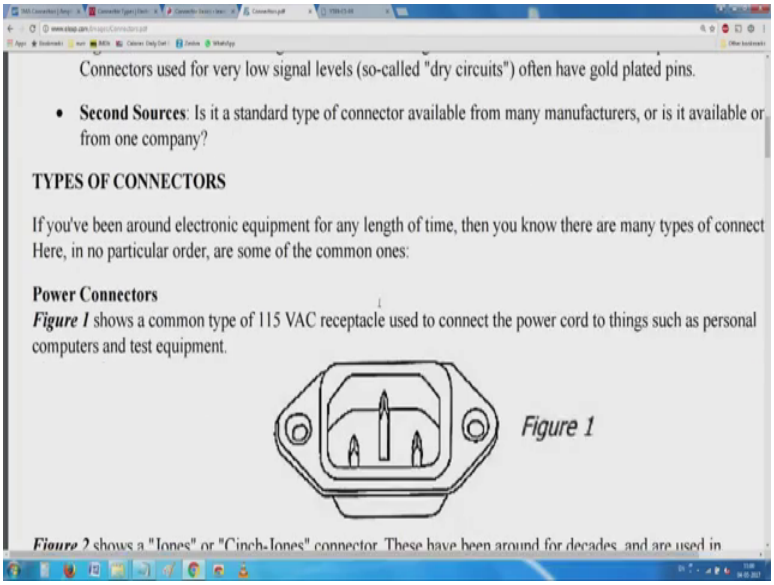


Is it a standard type of connector available for many manufacturers are available only from one company? Why should such a thing happen? (Refer time: 08:05) because tremendous amount of development expenditure has gone into it is so, for some reason they have overcome the shortcomings of their layer what you call (Refer Time: 08:18) old designs and then they have improved them. So, as it comes it may have several things you want one particular combination of, let us say both normal contacts and (Refer Time: 08:35) and all that only some people make it is not as easy as we think. So, as we go down here slowly we come to more and more interesting and familiar things.

You have seen that number one is power connectors which I was started with it is I feel used to connect power cord PCS and test equipment here. Lastly because it second from a source from them it shows 110, but normally you see them also with 230 volts.

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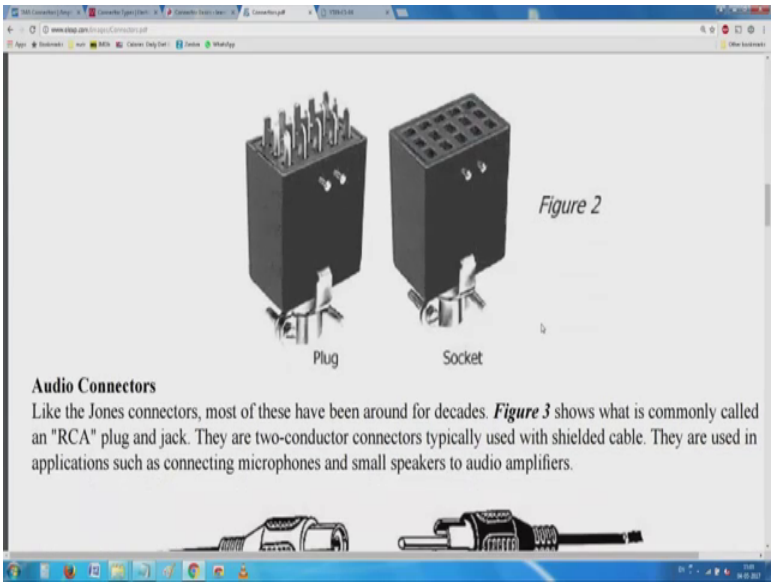


Oh, I hope you people remember this is ancient, but still I am happy to show you these things, a seen at the bottom we have a solid strain relief mechanism here. Then you have a shell here, then you can push one connector on the other and most likely and the top here probably there is some clipper something which holds them together.

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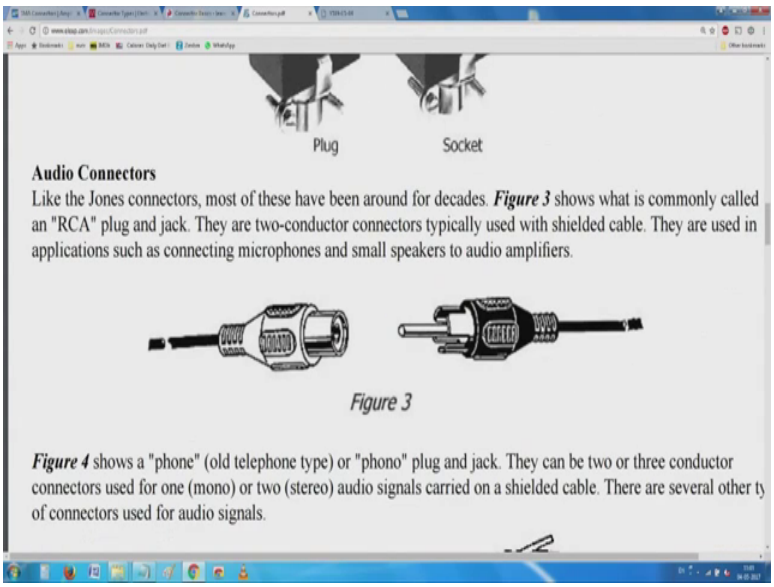


Let me be little faster I am sure all of you have seen these (Refer Time: 09:48) the username I mean some name called RCI in places here where I work now they call it a RCI connected no right know RC is started. It we will notice that there elements of it is

been coaxial the conductor itself is coaxial. And hence the contact also is coaxial, at the top at the top it is made springy and to make it springy, you need to make cuts on it. So, that it expands like this and come here, and then the other thing generally by a definition usually the one with the circuit contact is whole.

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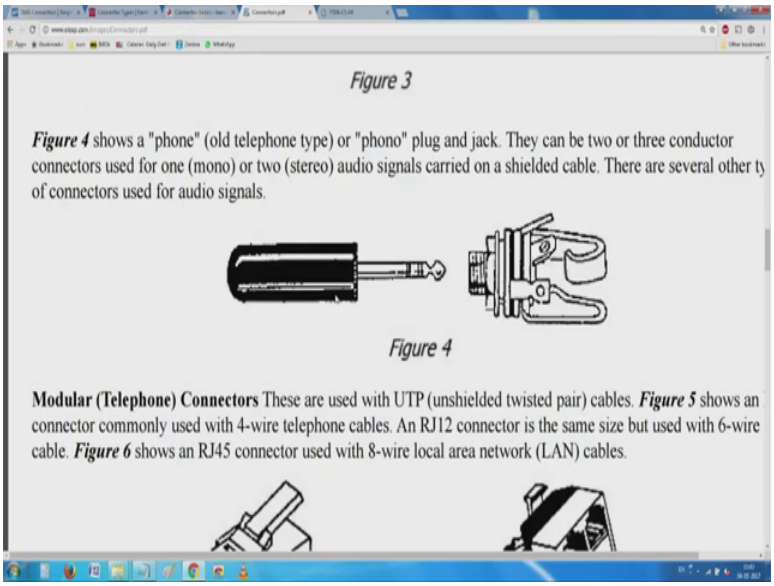


We come to very, very interesting thing, phono plug and jack. Looks good it is not it is not strictly speaking coaxial connector as such because, the pins are not coaxial pins and sockets you know, but overall outside thing is good and then on the other side it can go to a coaxial cable, is the how most of your mobile phones any audio equipment and all that. This goes on to the device which is a source and this goes on 2 things like your headphones and all this.

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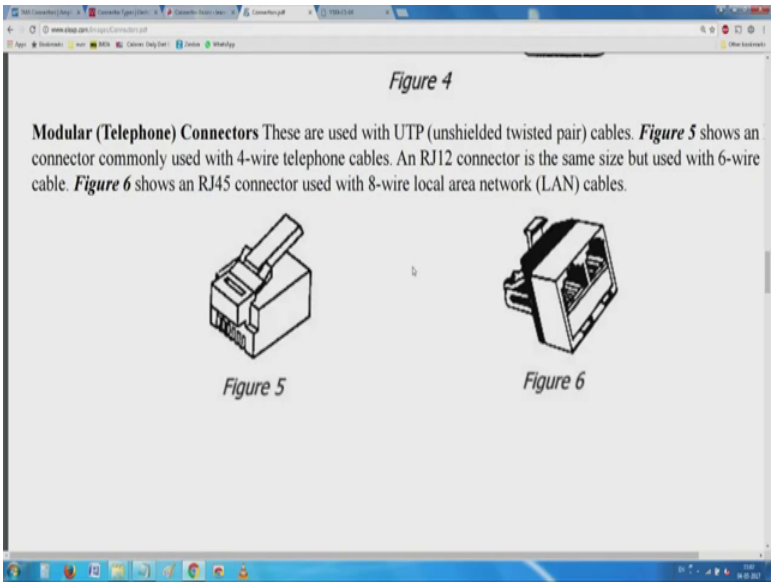


And we come do all these nice beautiful flat connectors, why it has been used to hear is that you have seen this no, I am not able to recollect to all that RJ stand for I am sure you are familiar with these you find them everywhere. This is typically is something which has a low number of overall operation. Every time you will not be using them, but all the elements has telling you including a lock here. Including a housing here, and including all this pins and something it is any of you have been in the field will notices the way the cable is clinched into this.

There are par what you call I am sorry, clinching devices which you put the cable and one side it does the x ray thing other one then push it inside. And you have a reliable from the cable to this socket arrangement. Similarly on the other side from a cordless set or anything at the end of the cable other part comes and then nicely they go one into the other. You have seen this is a small projection here and then the connectors are here outside. And then connections are the wires are her and then it neatly goes inside that one goes here in clips in place and this is scoket and that is the plug portion of it.

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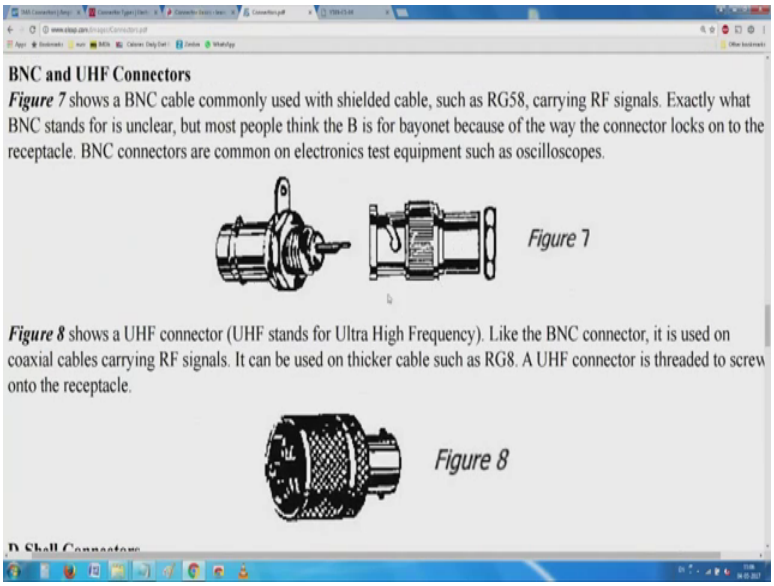


Now, I am sure all of you are familiar with the BNC and so called UHF connectors. So, we have the shielded genuine coaxial connector. Exactly what it stands is for us unclear, but I am sure it is clear (Refer Time: 13:37) stand for b a time n is generally type and that interconnection and it is very, very common. So, you see we have a nice device here which engages onto this spins here. I wish that showed it the other way and this side here is where all the beauty of even outer conductor inner conductor which are terminated elsewhere in things it shows. And then after that we have beautiful nut witch under properly assembly and if you do this thing in the packing, it is quite strong it does not get jerked out.

And now you see the other end of it here. There is a beautiful arrangement of what the outer and inner conductors, and at the back large number of panel mounting options are possible. You have simple 2 hole mounting everyone single hole, or in this case there is a nut at the back then you have standard flange mounting with 4 this thing. Further if you go down this probably at one time what you call it took a little time with frequencies on and all that. As things went on to the So called ultra high frequency, this is come down to saying a we need a more reliable connections and hence know ultra hey frequency, but this one has a threaded think.

Above you have BNC similarly TNC also, but this is called a thread UHF of connector. So, which is if you have a reciprocal with thread, similar things are used for everything,

but you see a little thing about this thing here it is 2 ends one part of it; obviously, measures here the other part of, it is actually an adaptor. This one has the same feature here which will go and fit here like that.

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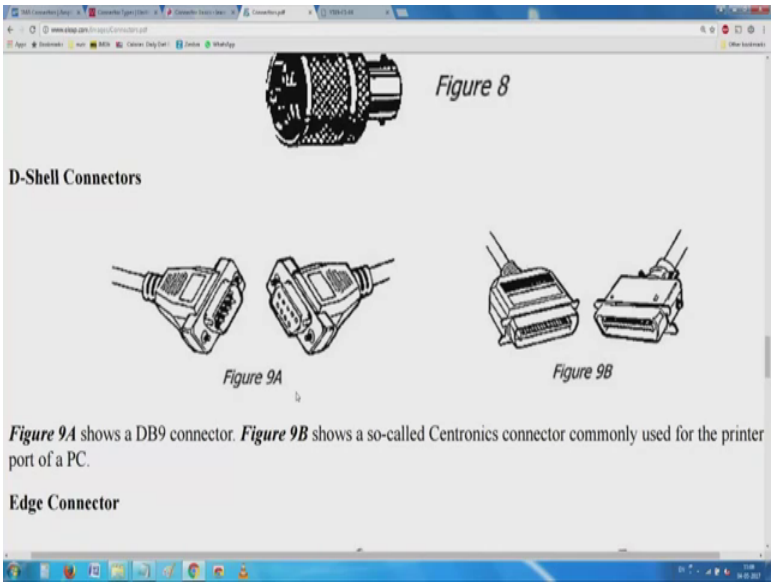


But as a Expansion I am sorry, other things to explain these are reasonably good.

So, at this point if you can recollect all those outdoor equipment which I have shown their layer pictures, all of them carried these type T connector as a beautiful ragged thing which is there on the top you fix it. And occasionally depending on your interest in (Refer Time: 12:06) again even things like silicon or other rubber sleeves are available, and then if they use appropriate type of packing and all that their practical in, it can be made IP 67 even underwater also the special connectors can use it.

As stand corrected as I do not know how to do it is just that I have read it like you. And then this is probably the most commonly used tour or 5 plus 49 pin connector which you find everywhere. It was called a d sub connector. And this is the centronics old connectors which are used for the parallel port. At that time this was the standard. Right now since the arrival of our USB and type USB 3.0 more than one USB options, similarly if you have a printer port you can use it I am sure most of you when you have your laptop it also has a connector to connected to the projector as well as the wherever external device if you have.

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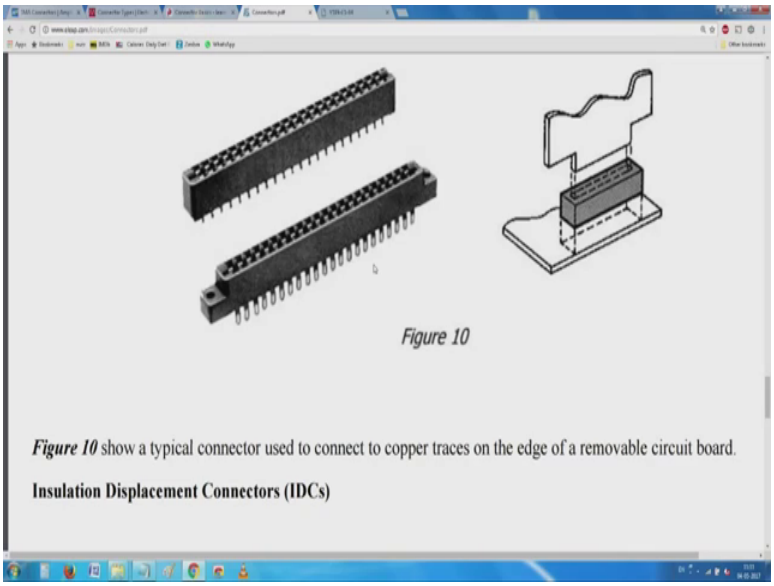


So, it has 3 rose I am not sure whether it is 21 pins or not. That connector somehow come has come to be as the RJ connector, because all of this project is and all work on the old RGB think So, RGB 21 pin you must have seen without it is a very common thing is now replaced by the HDMI. As you go down here we are coming to really nice you know you (Refer Time: 18:13) people like us Negro (Refer Time: 18:19).

Advantages is you seen on the right know it is explained, if you have anything to circuit board, preferably double decided, we have the harper other contacts, all you need to do on the printed circuit board you need not mound a separate 2 piece pin type of connector all you need to put it is finger contacts on both sides a little bit of devil dead can you put inside they go nicely inside here. So, again here 2 variations are have shown here you see this one is directly solded on to a printed circuit board.

So, before the full specification of 10 41612 and 617 came bout. Most motherboards had this type of connector mounted on another board and then something a little like a buzz was created. But then you can do part of it can be buzz and then you have a higher end low point and so on. This is same as (Refer Time: 19:22) contact interface is same except that this comes with soldering legs. Advantage of the soldering legs are, you do not need a printed circuit board. And then if you have a cable which is either flatter or circular still you can neatly terminate on this. And then at the back usually there is numbering.

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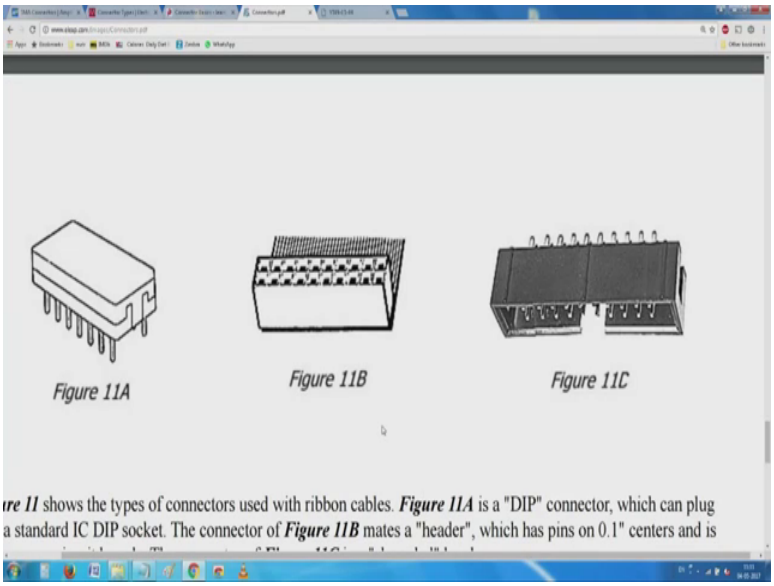


Finally have ended up this beauty of these things, so installation displacement connectors - one well known things is this spectroscope I do not know 3 m or amp or who has made it or it is a same company. Advantage of it is your flat cables very large number of connections. And then you keep one of these contact on it then there is assembly tool, where is contacts or like this, and then when you put it inside it displaces insulation and nicely gets attached to hear, and you done properly generally there will not be any failure at the installation displacement thing. Only here frequently you plugin in and out you have a problem, but you have to open a PC and see even today the main cable harness which connects all the parts, this insulation displacement connectors are used with large number of this thing.

So, there several things including so many of these things, I will I will just skip this. Having talk to you a little about those connectors I suggest spend a little time and try to read up about the various types of options that are available.

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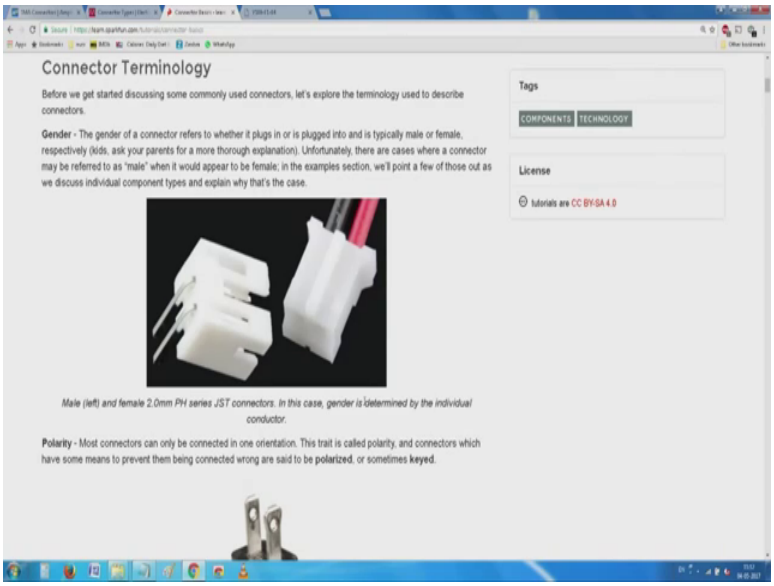


Because this connectors thing is just about that too many of them are there just too many. And then some of them are their intentionally designed that they will not make or will not accidently somebody does not push something inside the wrong position. So, if you have to take a cable harness of a car. Cable harness of a car is a big affaire, and not operated by only a trained operators.

I would like to operate my car. It does not move after it is a separate problem and I probably pay twice as much to get the proper electrician to get it back, but I would like to hack or (Refer Time: 22:14) around with those things. There the connectors are made very, very careful. The audio parts and all which are already there are made such that if I install speaker it should go and meet with that, if I install audio system it should made with that, if I have a back end camera back not bacon I am sorry, rare hand camera everything should meet specifically with the dare. And I use connectors of course, with specifications which are commonly available which cannot accidentally be interchanged.

So, you look at my this thing here the word gender of a refers to whether it is a plugs are or plugged into and it is typically male or female. Will there be a gender less connectors? Yes, there are connectors which do not have a gender.

Meaning anything can met with anything else is it possible. Some of you have dealt with electric cars, would have come across anderson connectors, it is a special type of connector by which both look a little like the same and it can just as a very funny word

called, but wipe. So, wet wipes and you know it sit is here. Those things in a sense any connector can met with anything else, but it is when made very carefully such that as a colour coded then there is again one more header one more this thing and all that. So, that they would not randomly meet with anything else and then make sure it Trying to make it safe not about racism.

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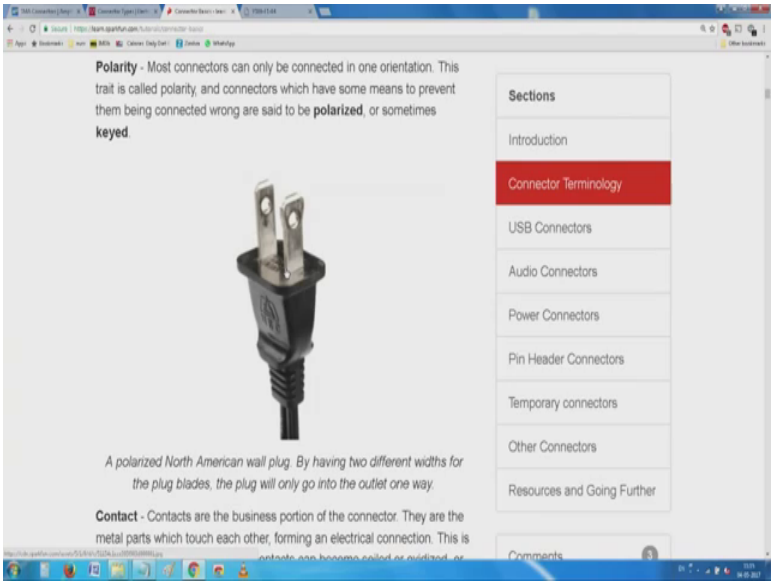


You have seen here beautiful, not many of us would have observed this. You have seen this? We are trying to protect to make sure that the neutral in the face are not interchanged; obviously, otherwise there eventually know everything has come into things which are 90 degrees (Refer Time: 24:30) one of it goes like this one of it goes like this. If they are just of rotated 90 degrees it will not go into each other.

Slowly we are coming into very reapply they have written I like this thing.

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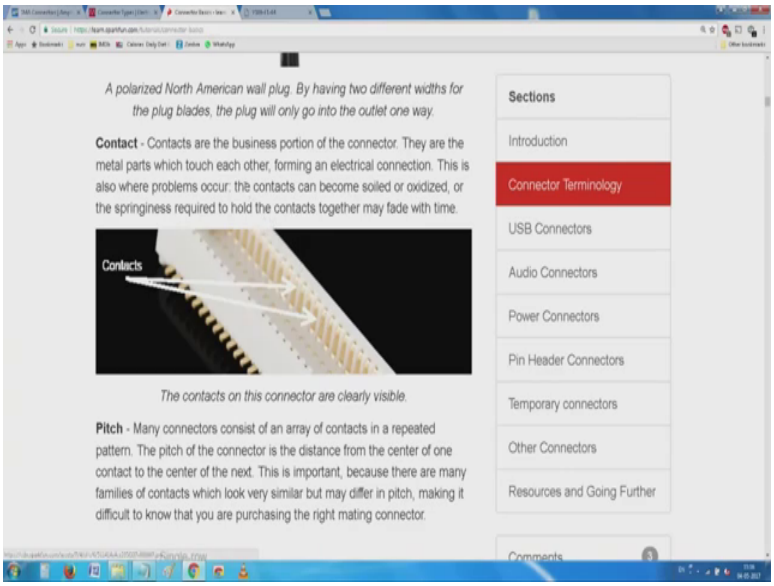


Business portion of the connector, by definition we need connectors to connect and disconnect, isn't it? There the metal parts touch each other forming an electrical connection. So, now there conductive elastomers also will ignore that, but right now in the in this context it talked about the, as I said the business of staying in connection. The contacts can become solid or oxidised or spring in a sur flexibility may fade with time why is not finally, it is made with one flexible material which is carrying current. And contact pressure is very critical, the movement the pressure comes down a little chances are movement that pressure comes down a little it may develop slight what you call contact resistance, because it was originally design for a certain contact area maybe a total of one square milimetre.

If the pressure becomes less some part of it maybe lifting of and that is where the earliest chances of heating will start. You do not noticed it also especially as I said no our parts sorry, we use this circular Contact.

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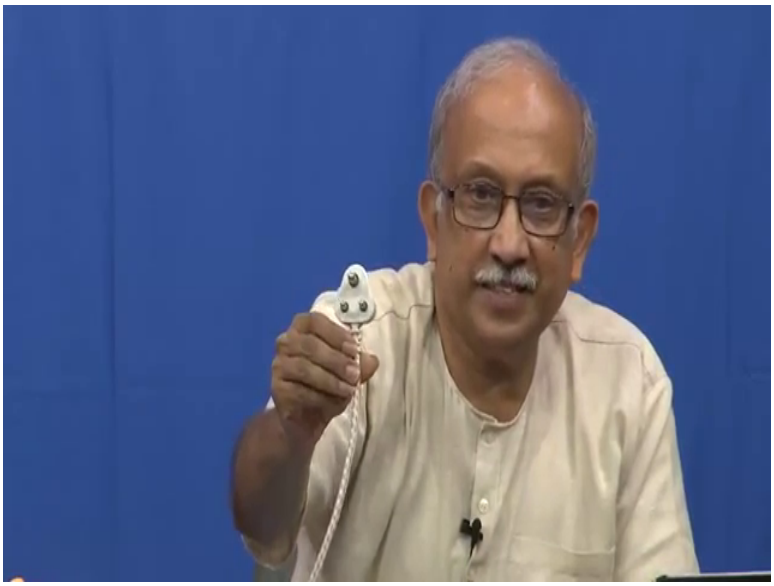

After some operations by some very peculiar physics the face part of this know starts getting hot. And eventually it gets charged vey rarely you find this happening with the neutral, I will reserve my statement, this is where it make sure that is a very probably the reason several places you know, especially I think in the USA you have come to flat contacts.

Advantage of a flat contact is this plug is flat. And you can design the sockets such that it makes a beautiful nice wiping contact here and takes it back; however, if you have this circular things you have a little problem we have a tube and then we have a plug which goes inside. Theoretically 2 circles one will not fit other at the same it will not fit. You something is a little bigger it will become end up with the line contact. To prevent it what they do they provide 2 slit is or sometimes 4 slit is still, from one line contact you end up with maybe one more line contact. Still the guidance and all that is directly taken from the electrical part of it.

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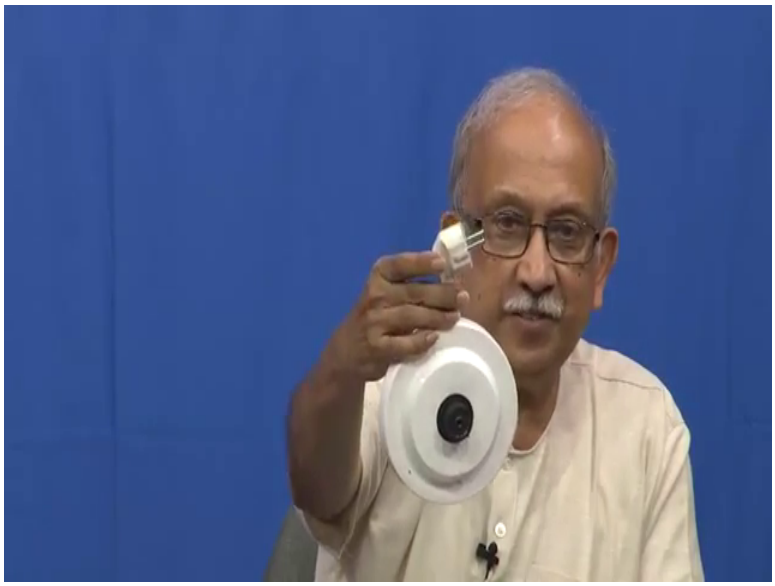

In contrast with This, I am not sure whether it is dim or what type of it.

You have seen here part of the guidance is taken by the shell from outside until just before the contact is absolutely no issue. And then you see there is a small (Refer Time: 28:13) hear the moment it starts moving in, the whole guidance and then the parallel thing is made from where, such a contact very little chances of even here I have managed damage it because of constant use.