Op-Amp Practical Applications: Design, Simulation and Implementation

Prof. Hardik Jeetendra Pandya
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore

Lecture – 47
Introduction to CDAQ (Compact DAQ)

Welcome to the module. So, now, we are going to introduce to our another unit which is available in our lab, which is CDAQ, which is called Compact DAQ.

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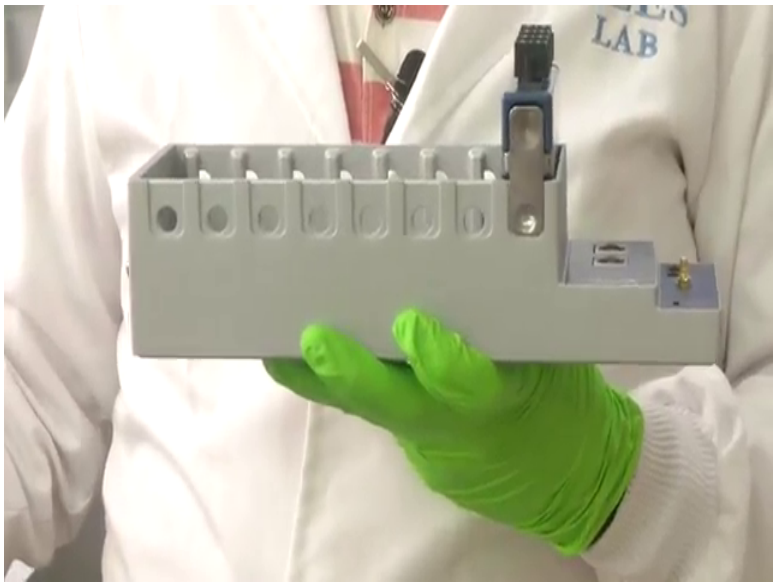

So, the advantage of this DAQ when compared to that particular device is that, even it can perform the same, but much more advanced manner. It has better accuracy, better resolution and better sampling rate to so that, even a smaller signals that is required to be acquired, can be acquired using this device. So, this I am going to place it on our anti vibration table.

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So, here we can see the both the devices, one is the previous device which I have explained you virtual bench and the compact DAQ I am going to play some my anti vibration table.

So, this is an anti vibration table you can see, so that even any vibration it cannot effect of the system that is being measured. And on top of it you can see different channels, modules those are called different varieties of modules which are available for the data acquisition unit itself.

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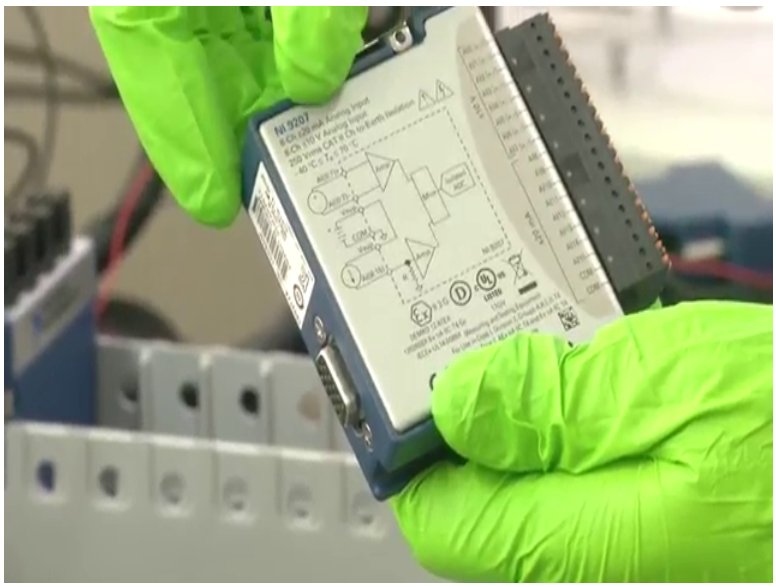

So, we can see here, 1 is analogue input channel, so where it can be used for input current as well as input voltage tool. And it has a on board ADC's as well as amplifiers everything.

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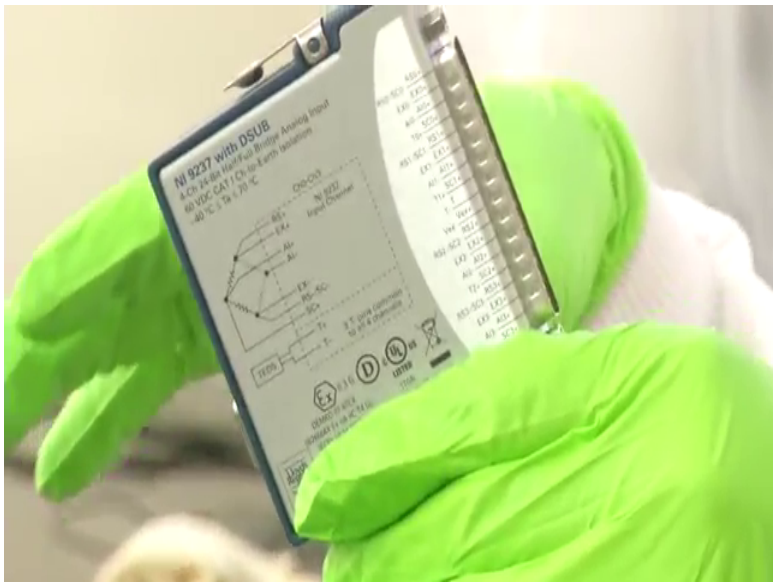

And this is for you know bridge kind of circuit, it can perform both half bridge and full bridge.

So, in case when we are dealing with 4 sensors are strain gauge based force measurement units. So, since this is are these are resistive type of sensors, one way is you required to convert your resistance change to a voltage output. So, one way to do is either a half bridge connection or full fridge connection.

So, full bridge connection will always have very good sensitivity, as well as very less linearity error when compared to that of your half bridge or something. So, in order to construct that, so if you have a précised, if you have a very sensitive signal conditioning unit, so it gives you more accuracy on your measured voltages. So, one way to do is if we have an onboard data acquisition with a on board signal conditioning unit it helps very very good.

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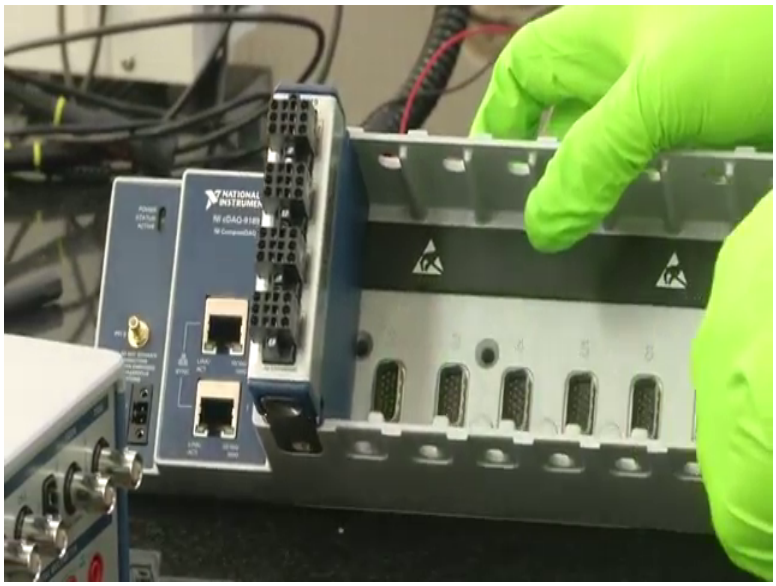

So, how to place in this in the sense, so if you see to the chassis, it contains different number of channels, so simply select the required signal conditioning unit or they call it as a module and place it on the appropriate channel.

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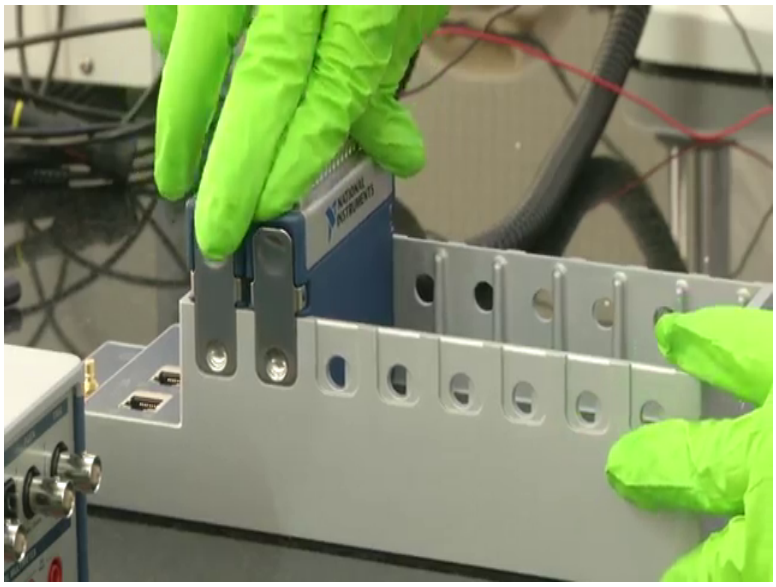

So, the advantage is that, it can be interchange, it need not to be fix only to the particular channel, even it can be fixed to the last channel anywhere wherever where it is required.

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So, we also have analogue output, say it can produce up to 20 milliamps of current and it is a 16 bit analogue output too.

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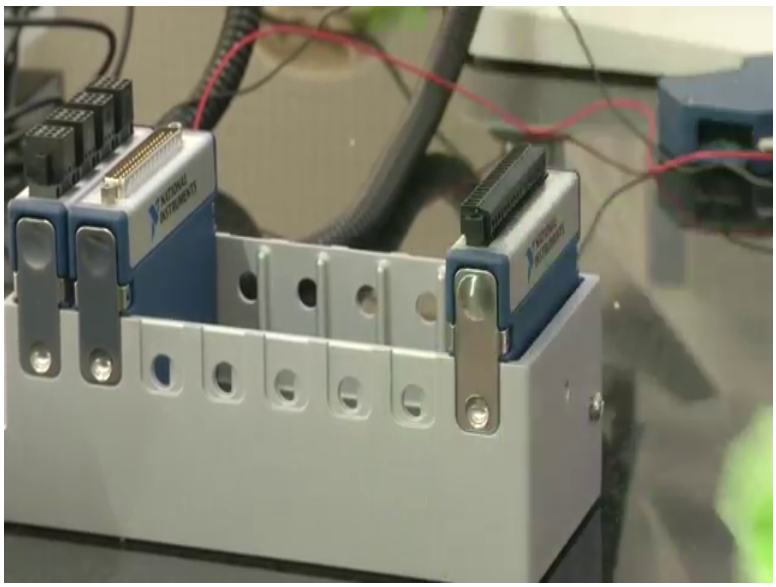

So, even this you can use it in the same chassis itself and all units can be performed at the same time.

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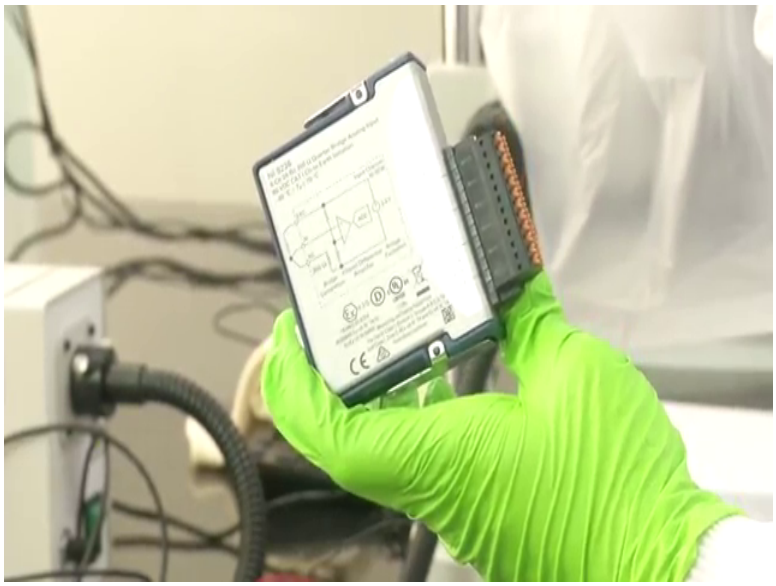

And other one is a quarter bridge analog unit. The difference between the previous module which I showed to this modulus is by making use of the previous model, you can perform a quarter bridge, half bridge and a full bridge, but by using this module we cannot perform half bridge as well as you know full bridge. This is only meant for quarter bridge applications.

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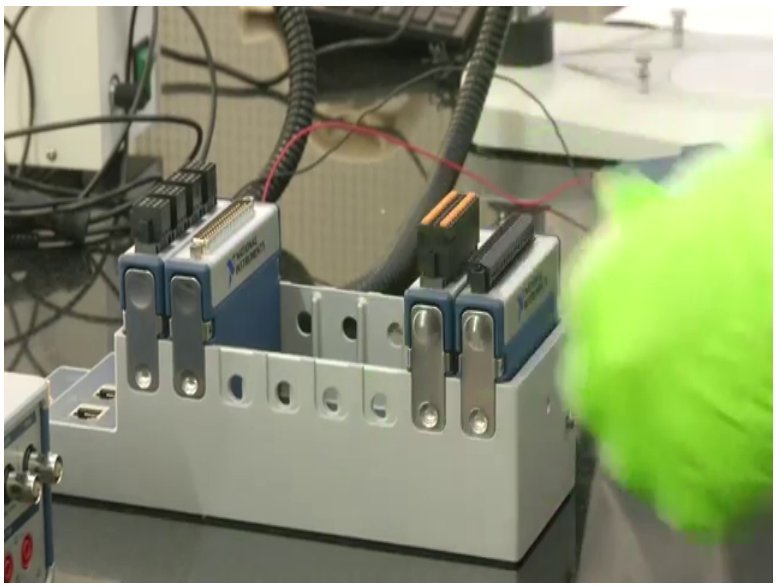

So, even this I can place it on the module on the chassis, just simply plug and play very easy to connect it.

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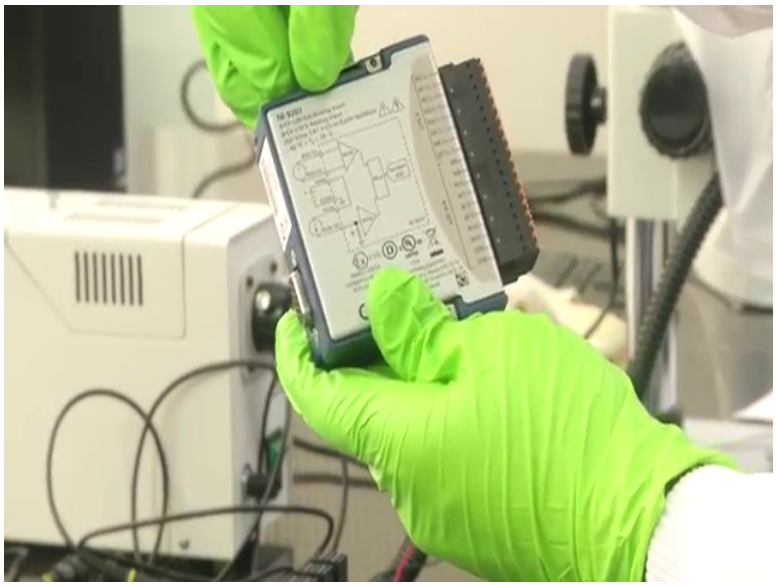

And this is another one, which I already told you. It is analogue input either voltage as well as current can be taken as an input to the system.

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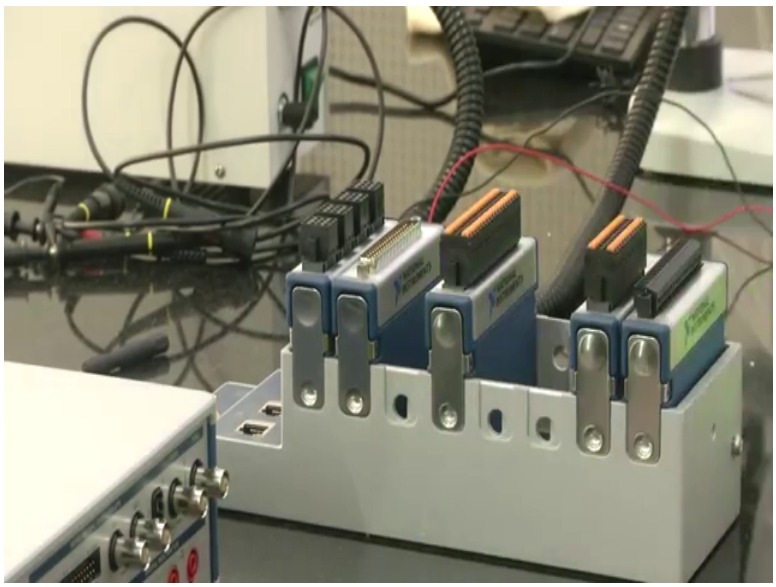

So, even this I am connecting it here.

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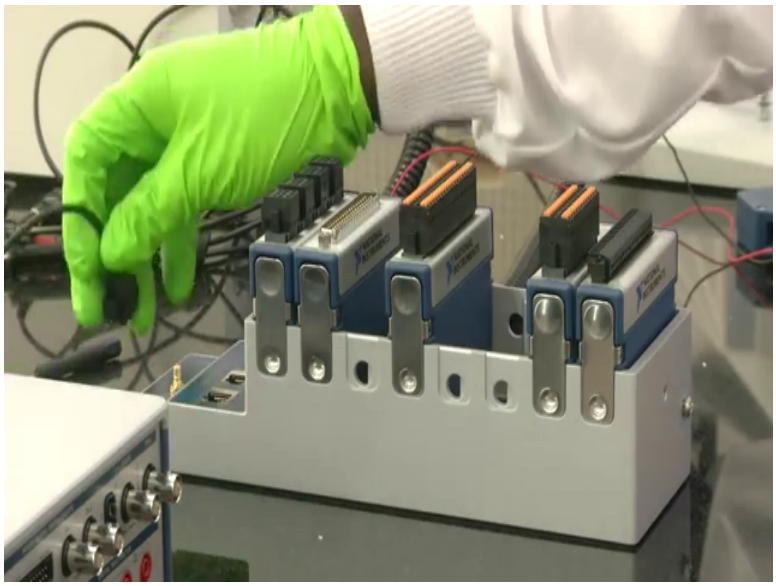

Now once I plug in, so if I want to visualise and if I want to acquire the data in a PC, so what we have to do is that, so since it is a compact DAQ it should always be connected to a PC; one way of connection is either directly connecting the WLAN connection to the PC or it if it can connect to the same network.

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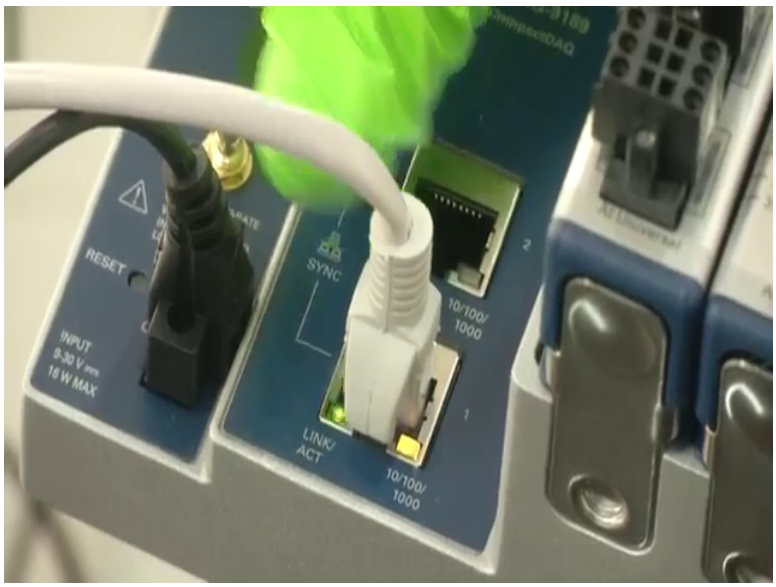

If it can connect to the same network, the purpose can be served. So, now, I am powering it up. So, we can see here the power has been powered up and it is connected using a WLAN right.

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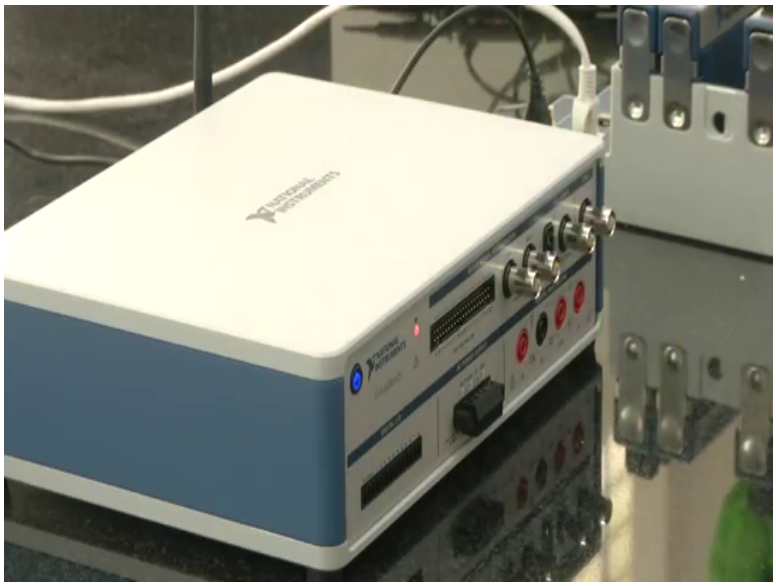

So, what I do is that, I will take few wires by using this work virtual bench, I will connect it to the DC power supply and if I vary the signal from the DC power supply, we can observe the signals being acquired using this CDAQ in our monitor.

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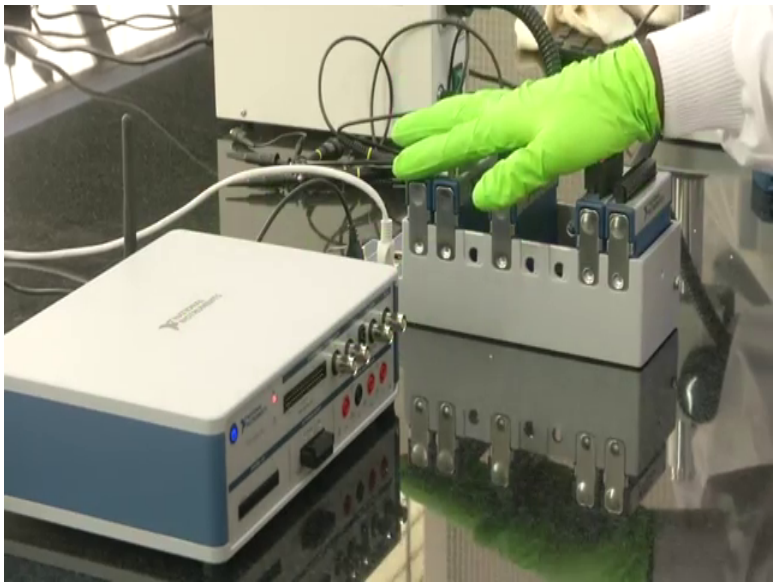

So, signals can be generated using PC from the virtual bench and the same signals can be acquired using another compact DAQ and can be acquired into this data acquisition device to the PC using this data acquisition device and even that we can visualise in between there is another software called lab view.

So, what we can do is that, whatever the data that is being acquired using this particular device, that can be acquired using the device and can be then a further processing using that device or if I want to make use of the same device for controlling even we can do that.

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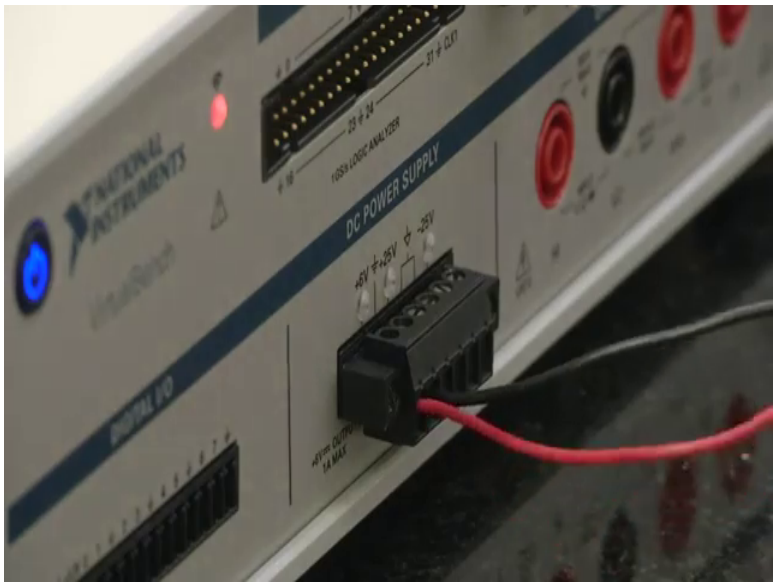

So, now what I will do is that in order to make understand our self, so I will connect a power supply unit to this and this is a positive. So, what I am doing is I am un plugging this device. So, here if I see a i 0 plus and 0 minus.

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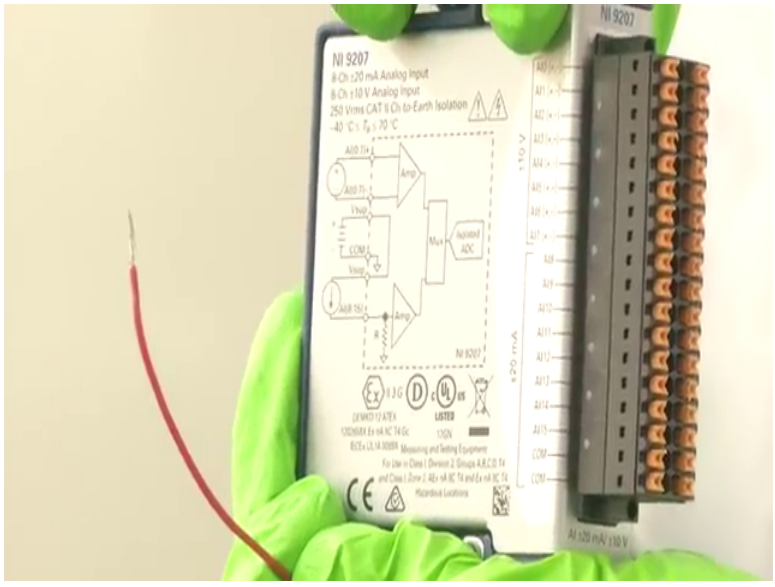

So, the first channel, so here if you see there is different number of channels starting from 0 to 7. So, total it has 8 channels for analogue acquisition which can measure up to plus or minus 10 volts.

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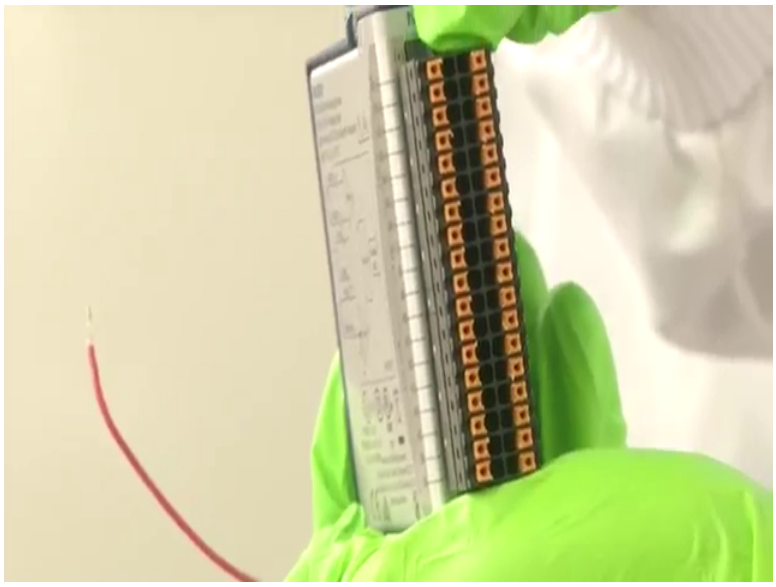

So, it has both positive terminal and negative terminal, what it does is that it can measure a differential input. Some cases where when you are using a quarter bridge or when you are using a half bridge or full bridge, whatever the voltage signal it is being generated from the bridge signals are not a independent voltage, it is a differential output voltage.

So, if I want to make use of a differential input; one way to do is that we have to make use of this device.

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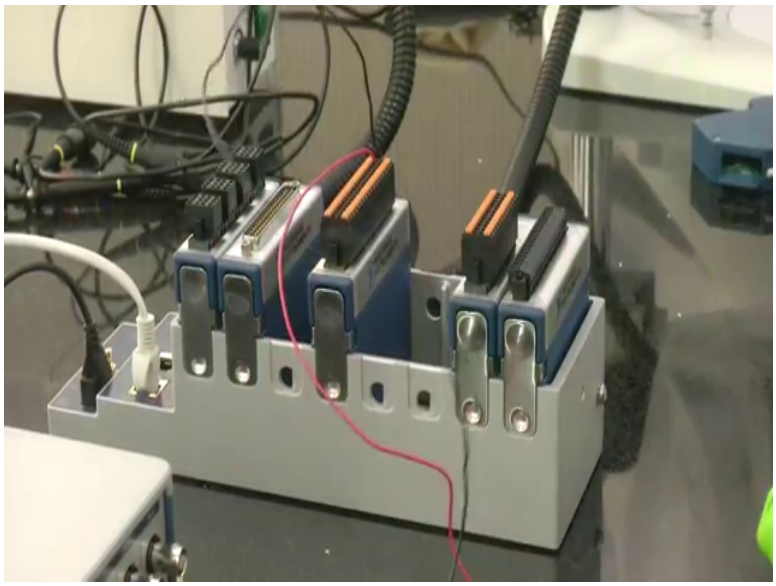

So, what I do is that I will connect this is some kind of a spring connection, so to the first channel, it need not to be only to the first channel it can be connected to any channel. So, right now, I am connecting to the first channel. So, since it is a spring device I have to press it and place this, connect it then to the negative, so I will pressing it, I will connect it. So, now, we see how do we connect our negative. So, since it is also a spring, so I am pressing it and placing it into the hole removing it, so that is connected. Once it is connected and placing it into the chassis.

So, the number is this 9207, whatever I am using is 9207 right. So, from the hardware point of view, we have done all the connection, necessary connections required to acquire the data using the CDAQ and to generate a data using voltage signals, using this voltage source from the work bench. Now how do we acquire, how do we visualise a signal in the software that we will see there. So, last time we have already seen how to generate a data using national instruments work bench.

Now, we will see generation in the software and acquisition using this level. So, once we finish our hardware connection, so what now we will look into the software. So, first step is generation of voltage signal.

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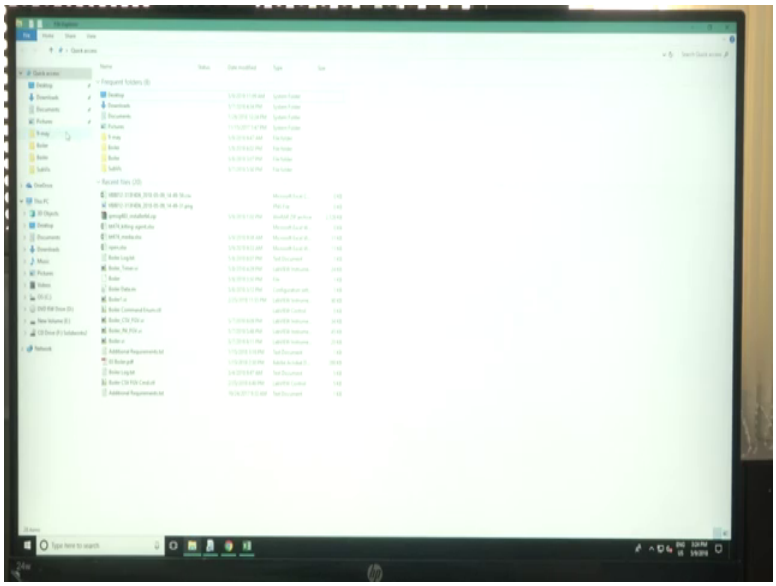

So, to generate that first I have to open the virtual bench software which we have seen in the last day.

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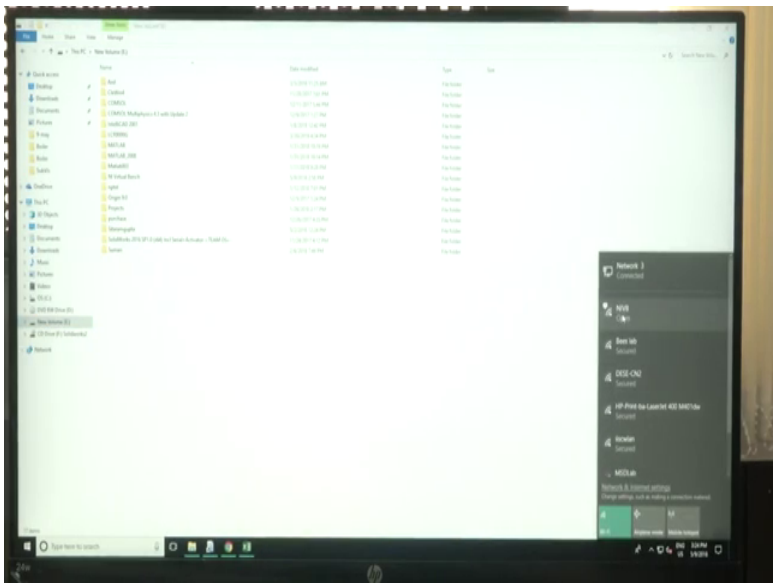

So, right now it is being connected using Wi-Fi device that we can see here and I am going to virtual bench software.

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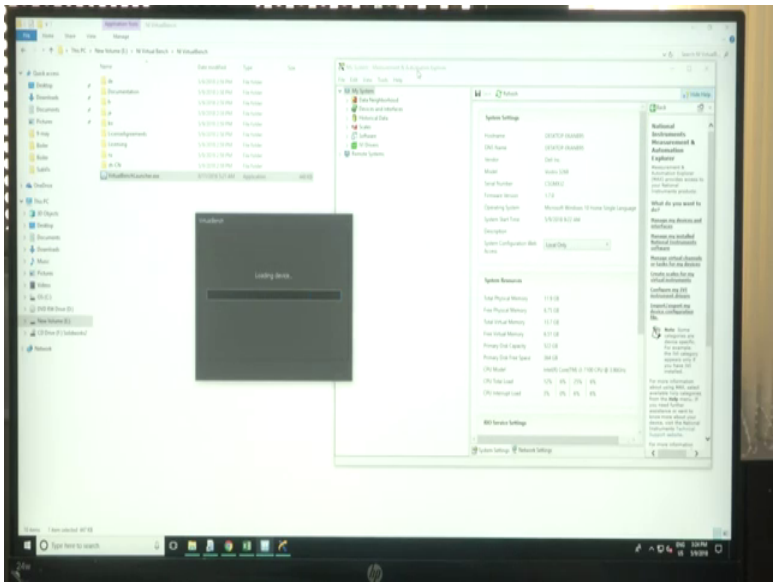

Start NI MAX. This is for CDAQ just to test the device has been connected and whether it is working or not.

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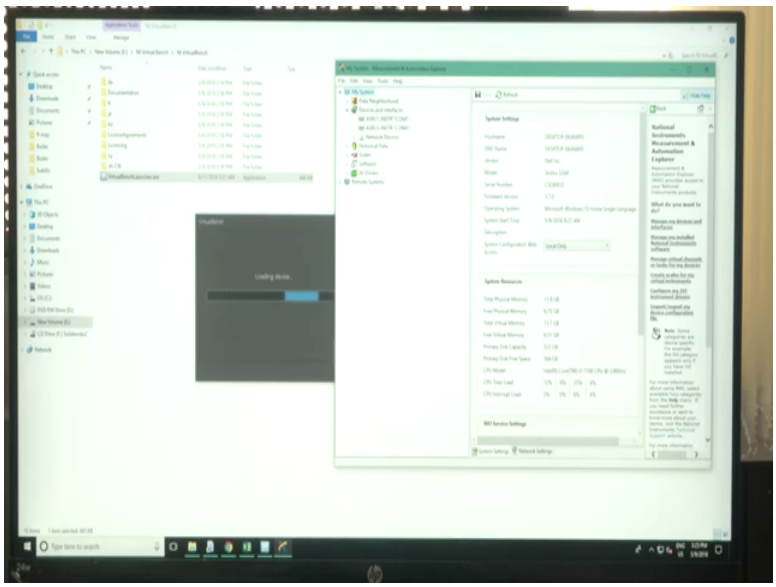

So, here we can see, since it is connected using a WLAN in a server, here we can see what are all devices is being, NI device is being connected in NI MAX.

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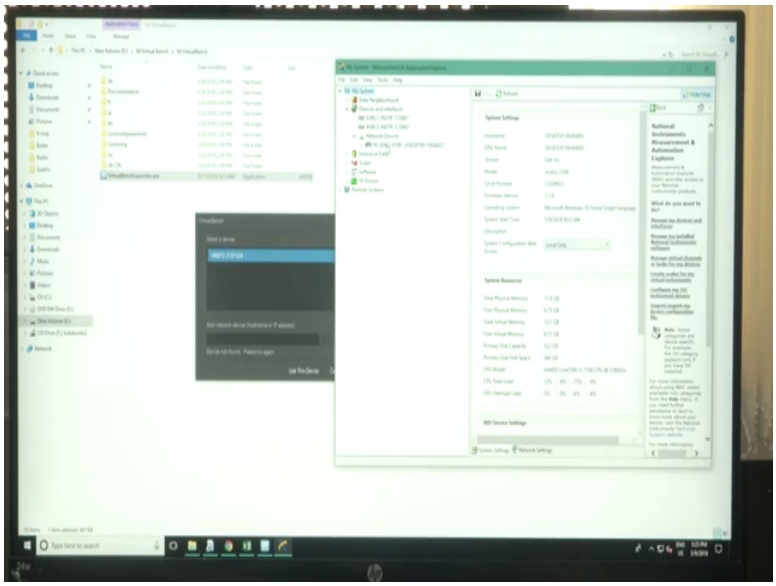

And here if I click on to the network devices, we can see the device name which is connected NI CDAQ 9189.

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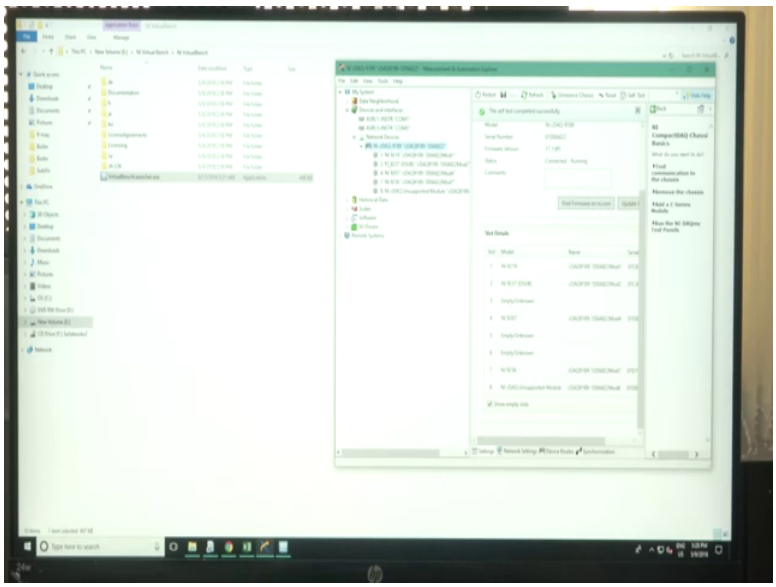

So, on top of it if I refresh it, what are all the channels is being connected can be tested it here, can be seen here. So, here we can see that device under the network devices, we can see what are all devices is being connected, on the same chassis what are all different modules are being connected.

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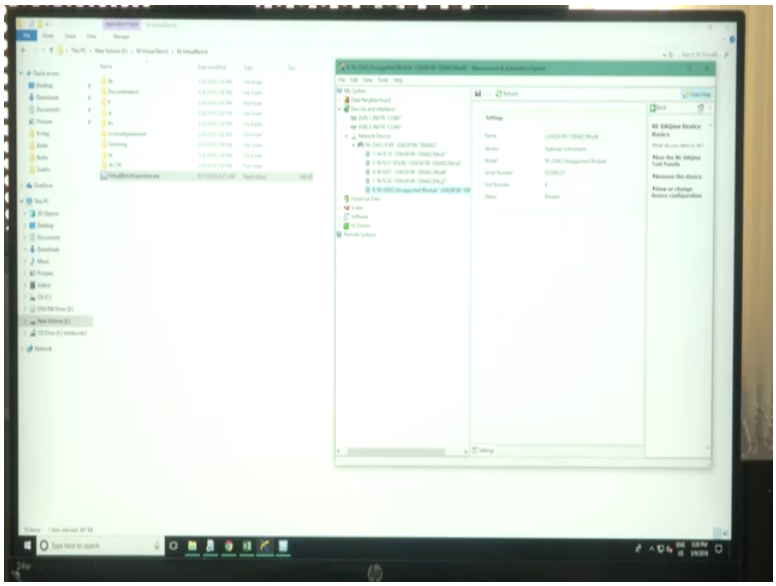

So, right now we are making use of the module 4, which is connected at the 4th channel which is NI 9207, which is being connected to that.

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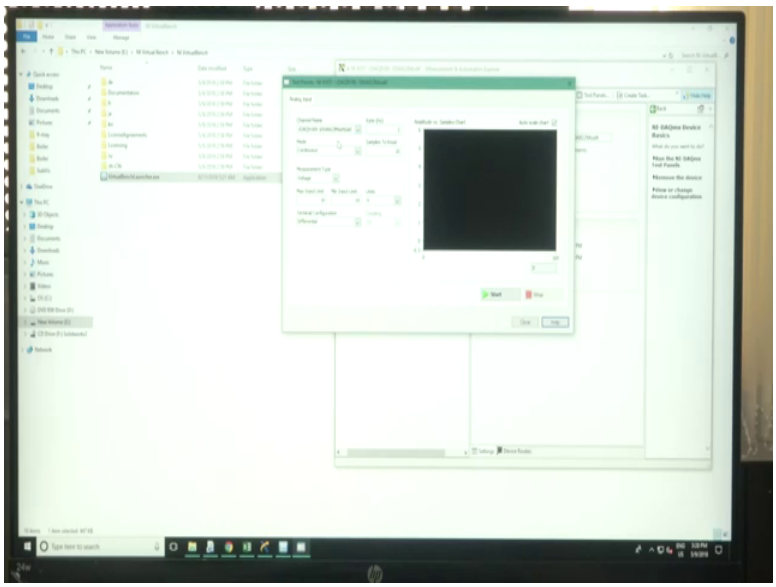

So, if I go to the test panels here to just test whether the module is working or not. So, we can make use of the test panels and we can work through.

So, I will go through the continuous acquisition and the channel whatever I being connected is was a i 0, so I am selecting a i 0 channel.

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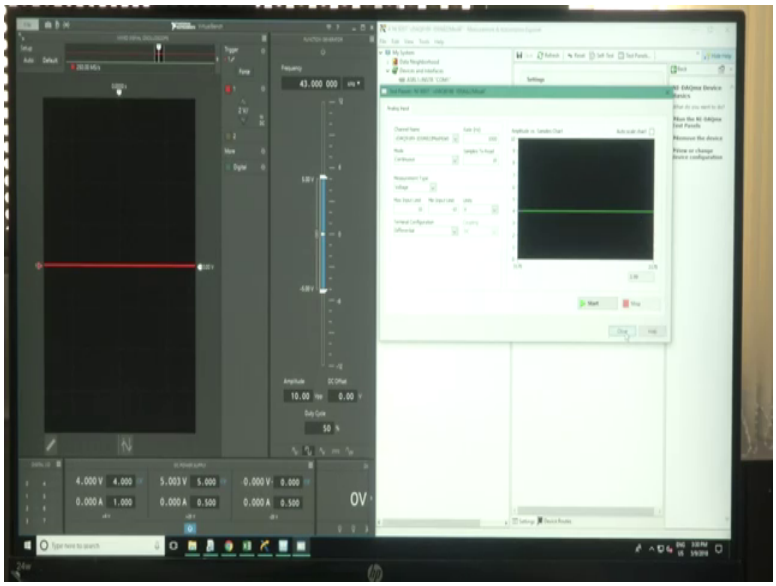

And the sample period is 10 samples and sampling rate is 28 if I say, what I will do is that from the virtual bench software which we have seen last time. Since, I have connected DC power supply of 0 to 6 volts to an input to this particular module NI 9207, so here I will be switching on this module. So, right now applying 0 to 1 volt, in the test panels, in the text panels if I start it, so you will see here, so the input voltage being applied is 1 volt, we can easily seen in the test panels I changed to 2 volts changed 3 volts, but why it is slow because, the sampling rate whatever I use is of 2 h.

Suppose if I make it have some 1 kilo. So, you can see very fast change in the input voltage 2 So, the maximum 6 volts, 6 volts, so this is the one way to check whether the at the test panels or to check whether the particular device is being acquired or whether the device is working or not by using the test panel, but if I want to do some further processing, we cannot do any further processing using this particular test panels. So, how to do in the sense, we have to write a program or write an algorithm in the lab view software. So, I can open lab view.

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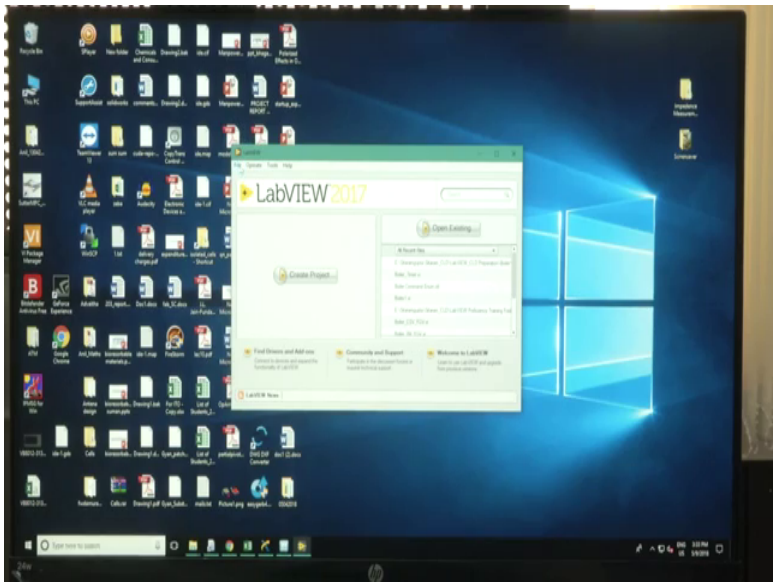

So, once we open it. So, this is how the lab view one looks like, so new here.

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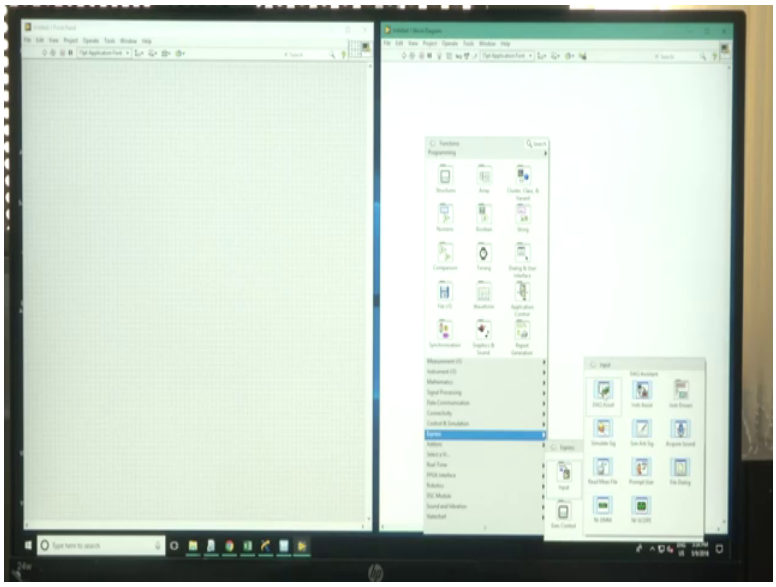

So, here we can acquire the data using measurement io or we can go to express and I can make use of single input data assist.

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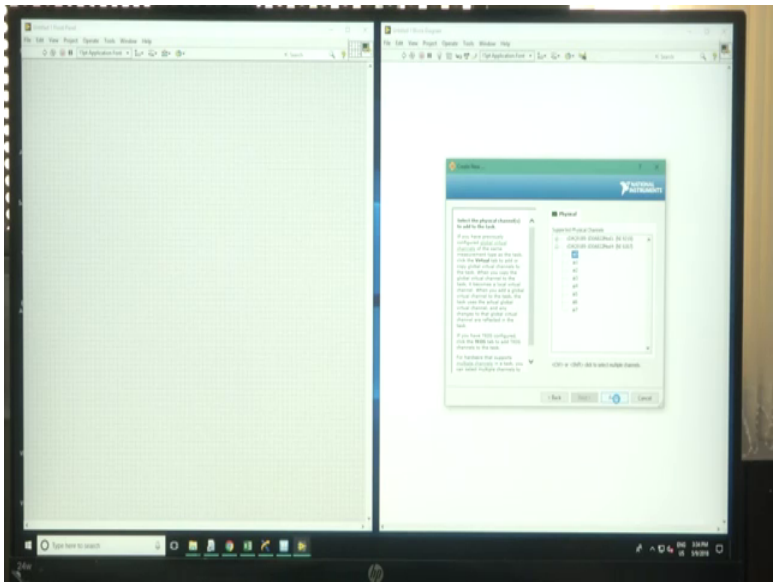

Acquire signals analogue input voltage by using module 4 a i 0, this is where we have connected to 9207 just finish it.

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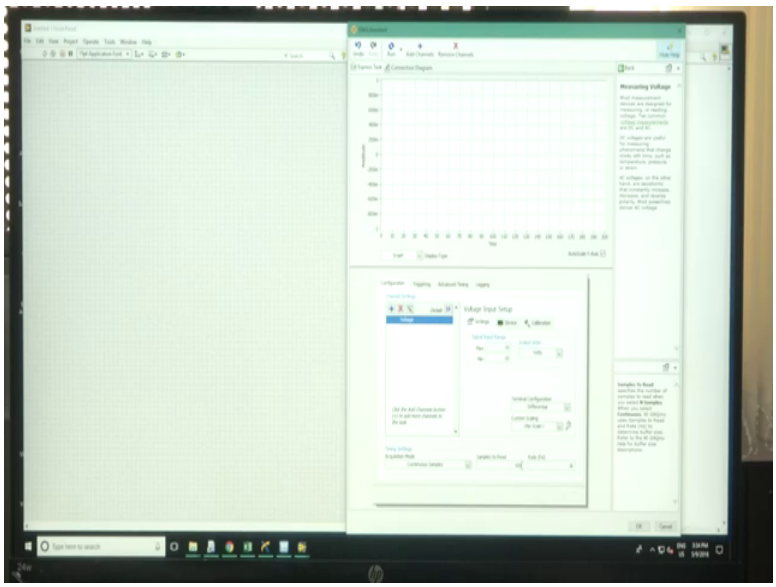

After this, so how many number of samples that we need it or I can make it as continuous samples, then samples to read rate at is of 10K or 1 K we can keep and the samples to read and making it as 100 samples to read.

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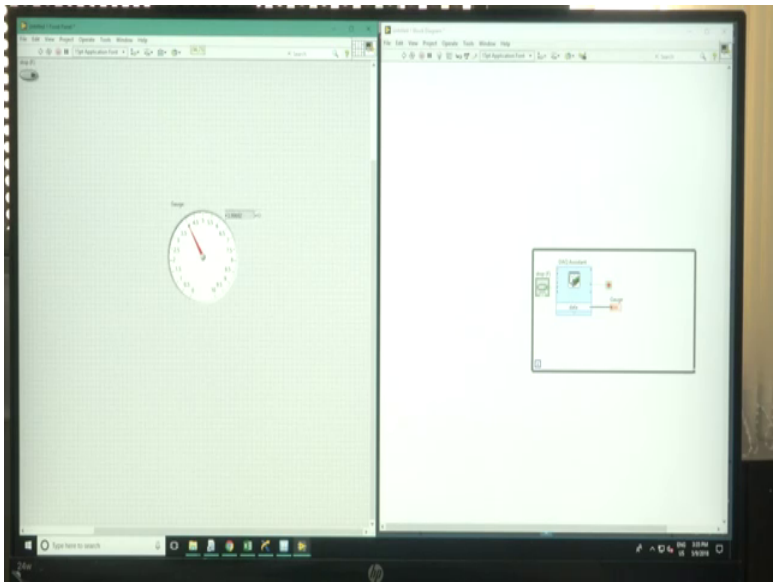

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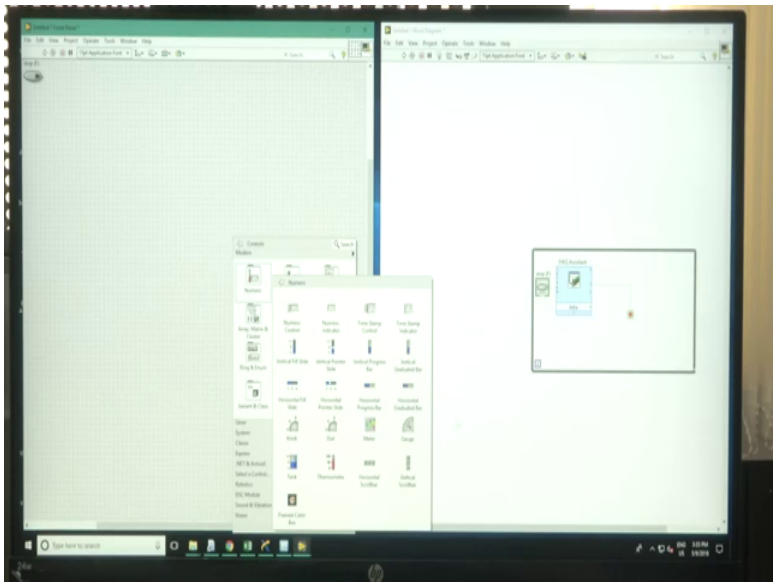

Yes, so the data which are is being acquired I will be displaying it on the front panel by using ammeter or some, some connecting it to the gauge. This a gauge and connecting to the data. So, if were on the PC system.

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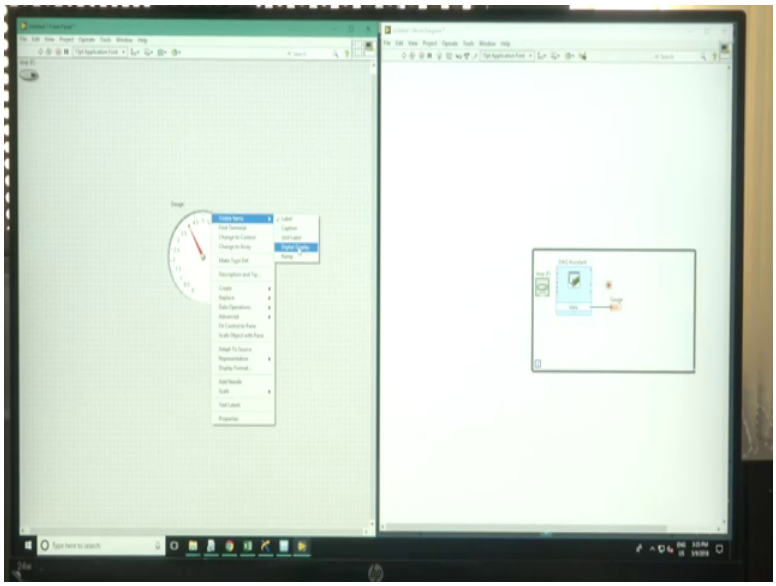

So, let me switch off, I will enable digital display to this 2 digital display, so that easy to visualise the digital data and I am switching it on.

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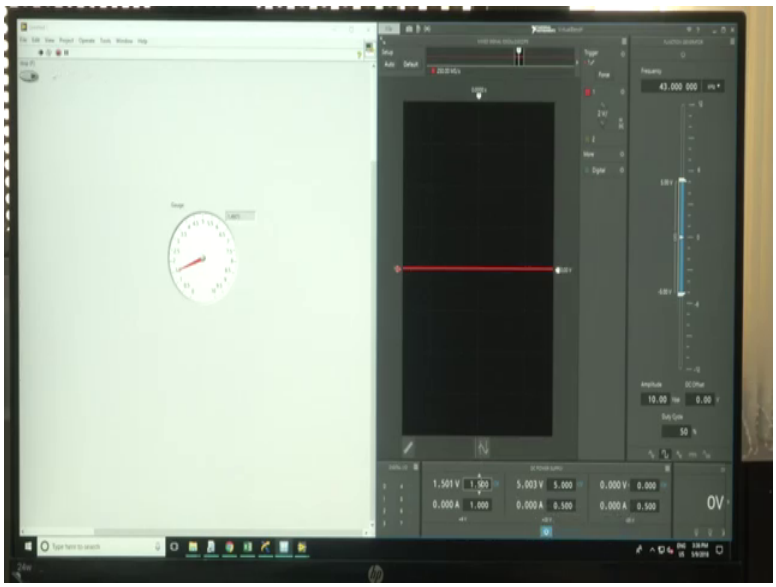

Once the switch is on, we can see 3 volts, 3 volts, 2, 1 right. So, whatever the data that is required, we can acquire using this particular software and using the software with different functionalities that are available with the software like different looping that we want to do, array functionalities, in numeric any other applications like Control logical

and activation of something. Everything can be implemented here and again you can give it back to any plant.

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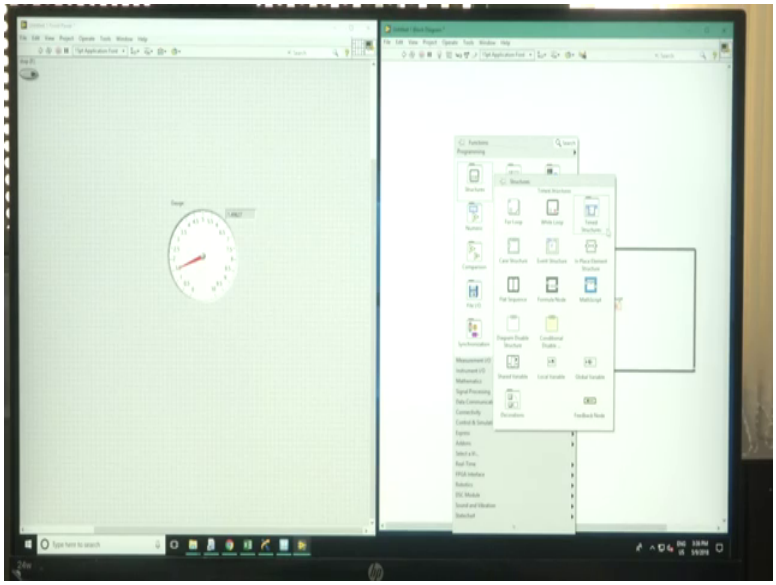

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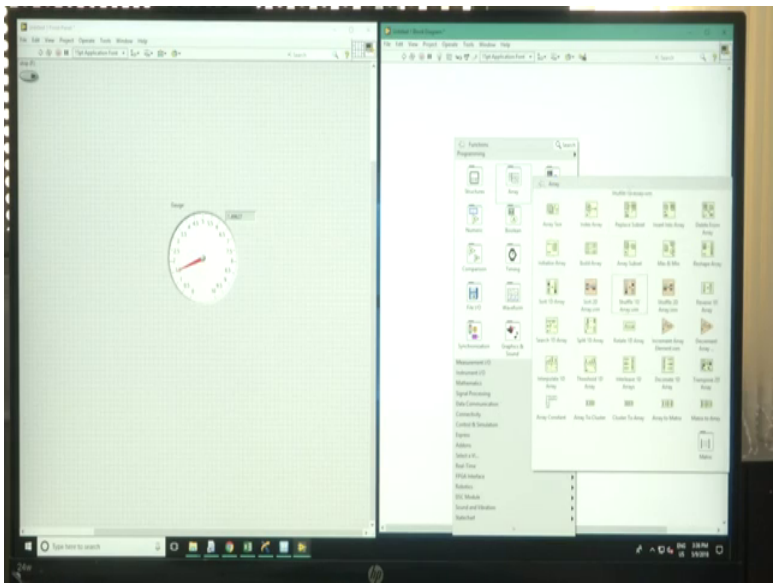

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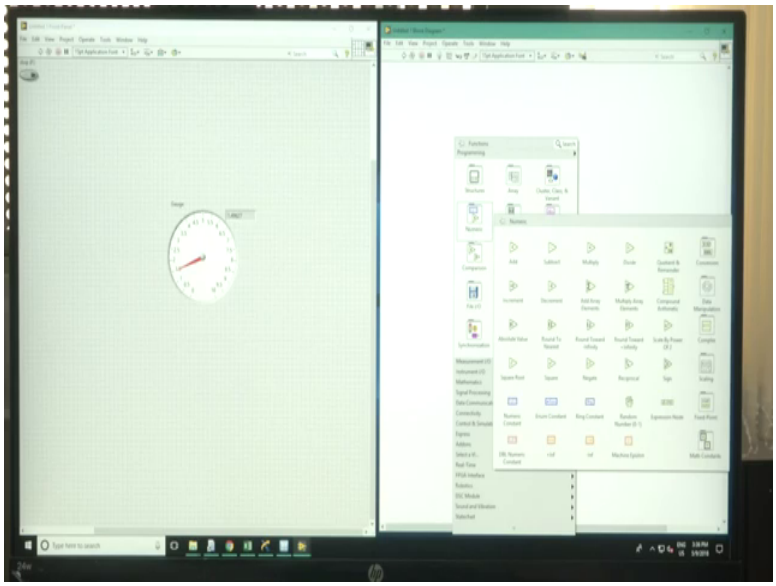

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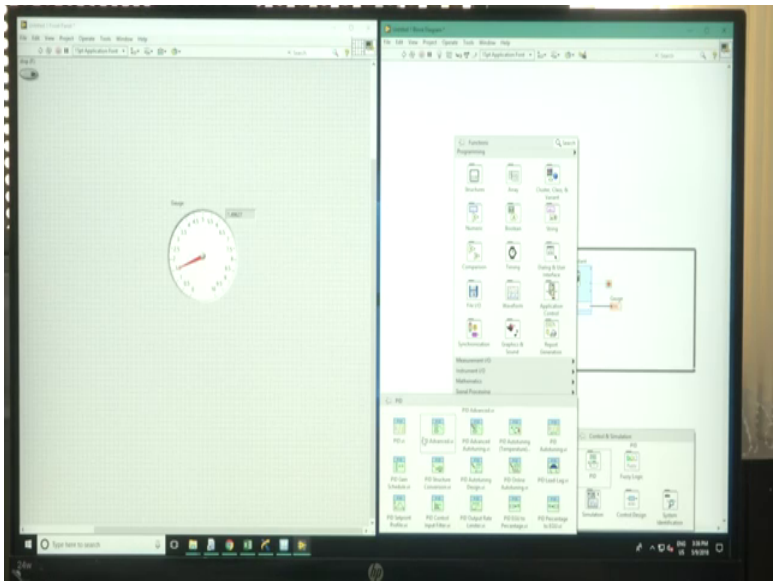

So, this is how this can be useful for acquiring, as well as a monitoring or a acquisition of the signals from a sensor and to do the processing using that.

Thank you.