LabVIEW Tutorials

T.1 Temperature Measurement and Cold Junction Compensation (CJC)

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Introduction:

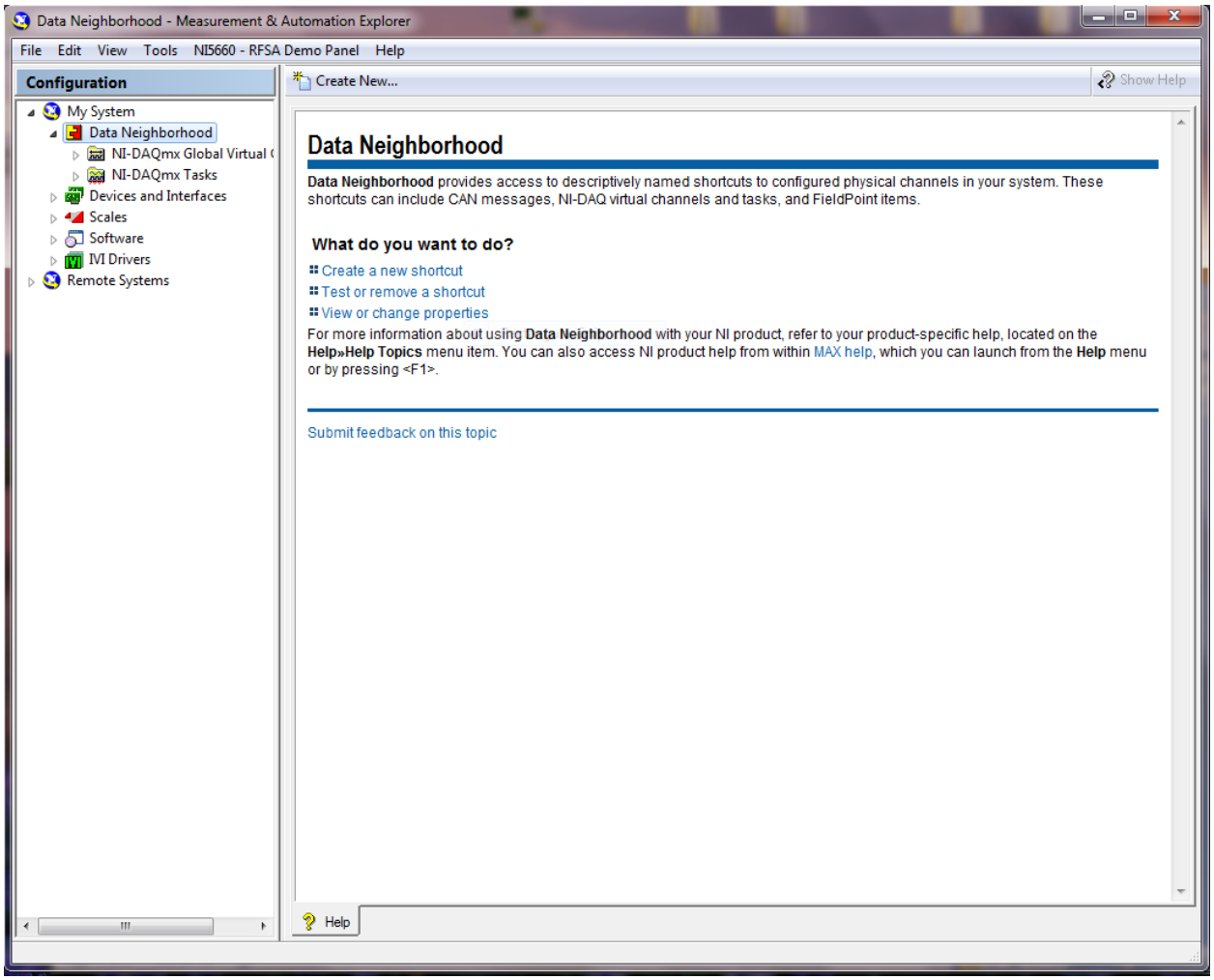
In this tutorial we shall learn how to measure temperature using NI DAQ Cards and LabVIEW while employing cold junction compensation in real time. Thermocouples require some form of temperature reference to compensate for the cold junctions. The most common method is to measure the temperature at the reference junction with a direct-reading temperature sensor. This process is called cold-junction compensation (CJC).

Procedure:

Follow the following illustrative step by step procedure to measure temperature using thermocouples.

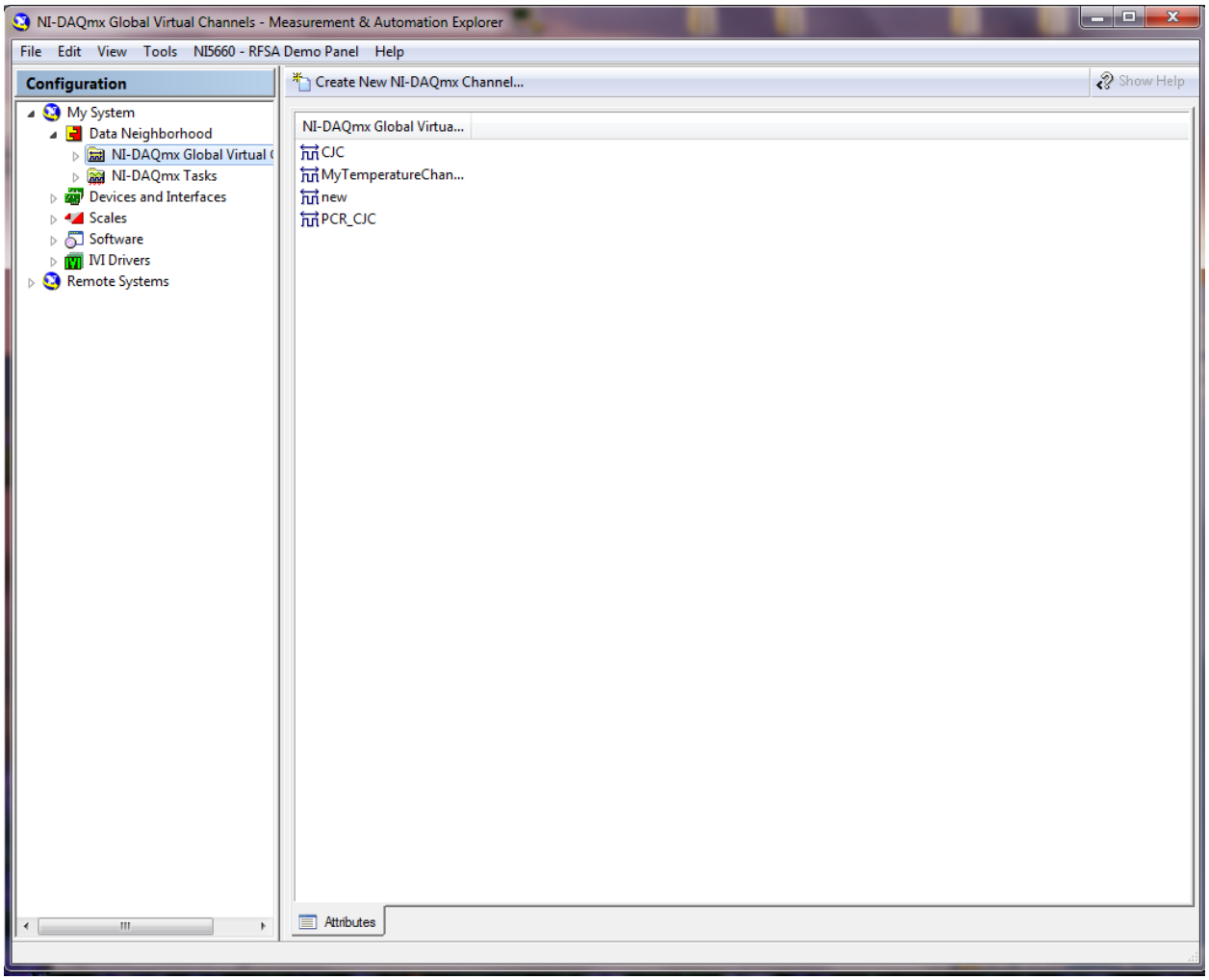
Start **Measurement & Automation Explorer**.

Under **Configuration**, select **My System** then select **Data Neighborhood,** following dialog box appears.



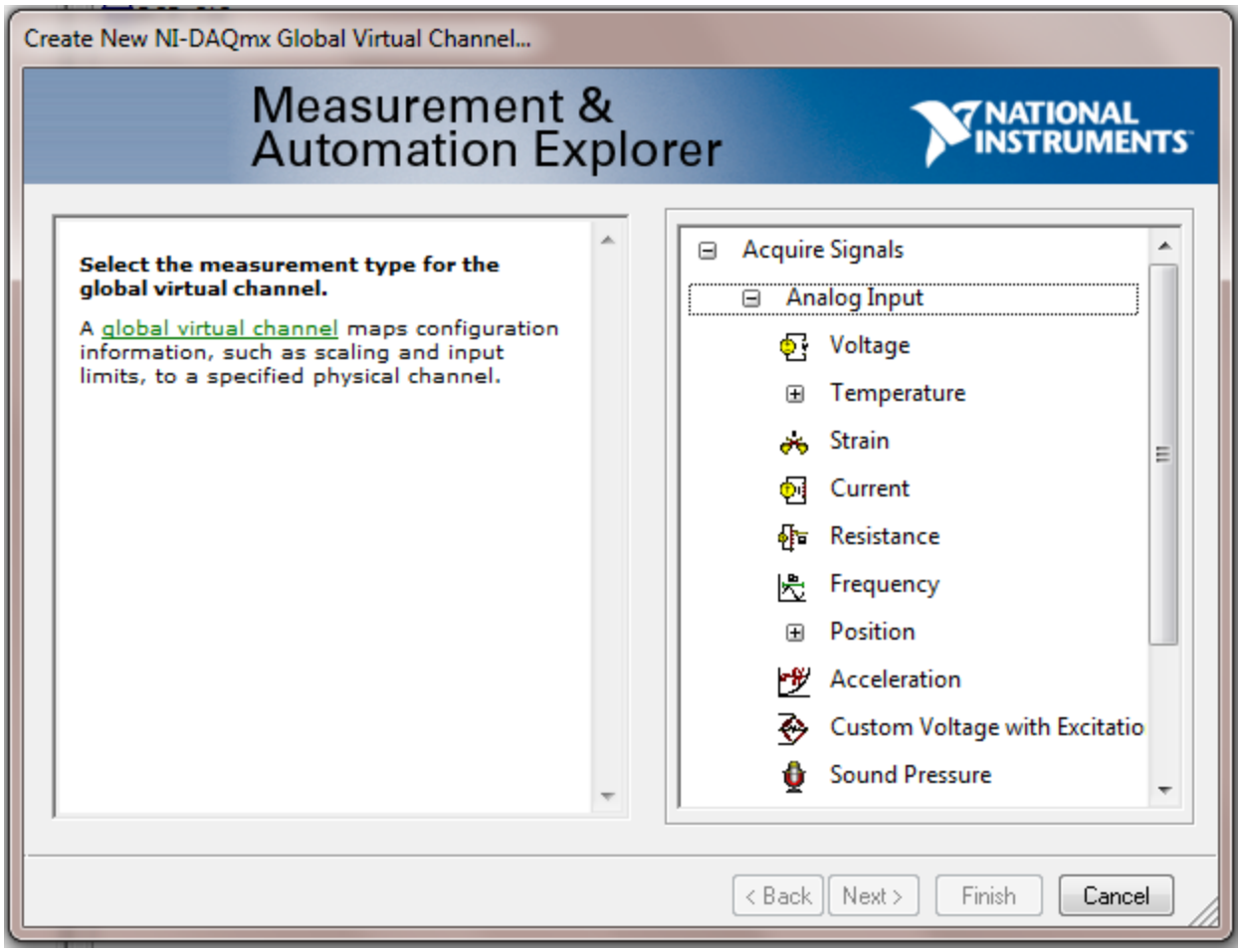
Click **NI-DAQmx Global Virtual Channel**

On the following window, click, **Create New NI-DAQmx Channel**,



On clicking, **Create New NI-DAQmx Global Virtual Channel**, a dialog box appears which asks you whether you want to create or acquire a signal.

Select **Acquire Signal,** and then select **Analog Input** and then **Voltage,** as shown in the below picture**.**



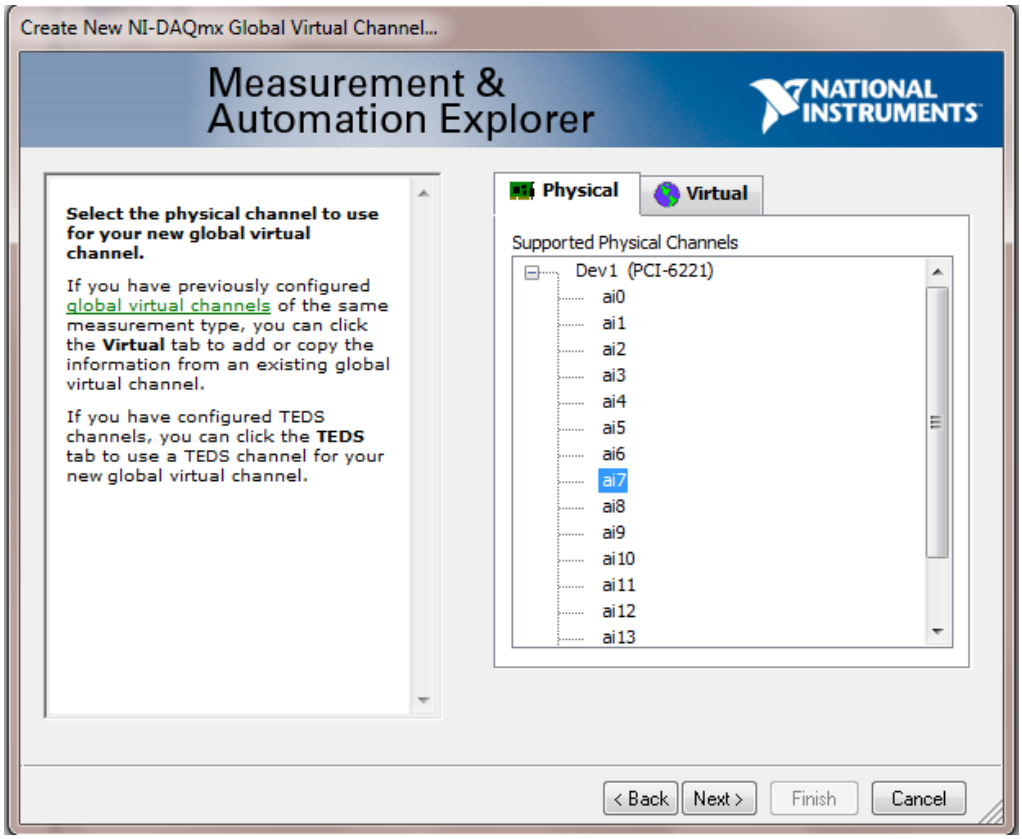
On clicking **Voltage**, following dialog box appears which asks you which **Physical Channel** acts as virtual channel.

Current SCC-68 connections:

PIN 57 (AI 7) is connected to PIN 70 (CJC+)

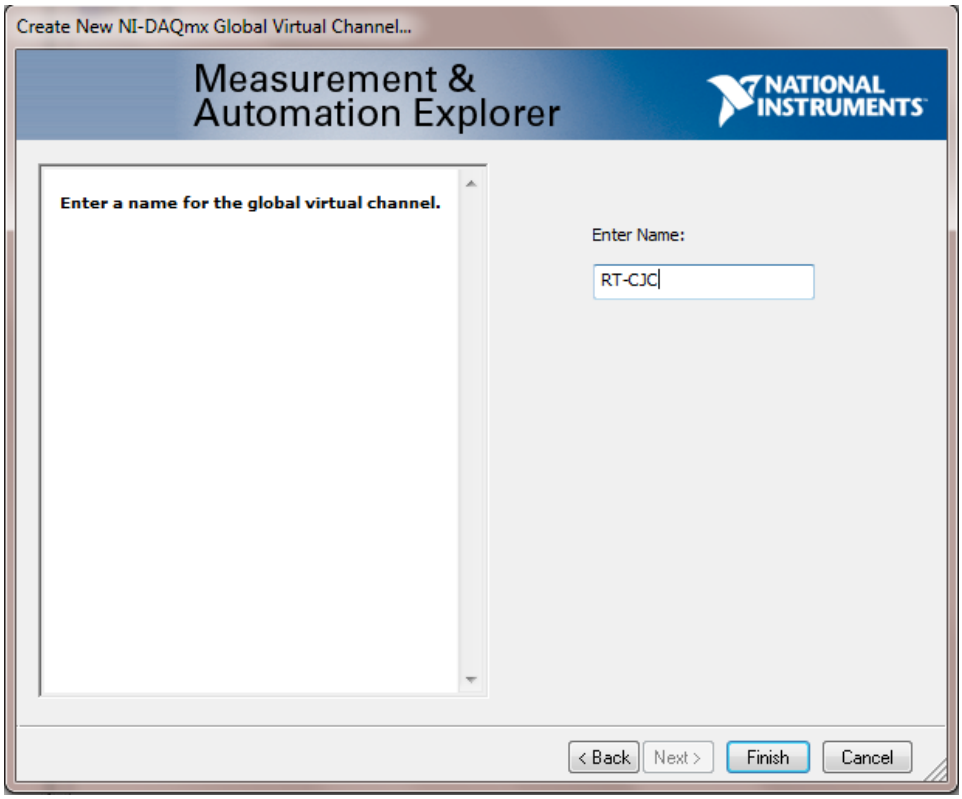
PIN 56 (AI GND) to PIN 71 (AI GND).

Thus, on the following dialog box select AI 7 and click on Next.

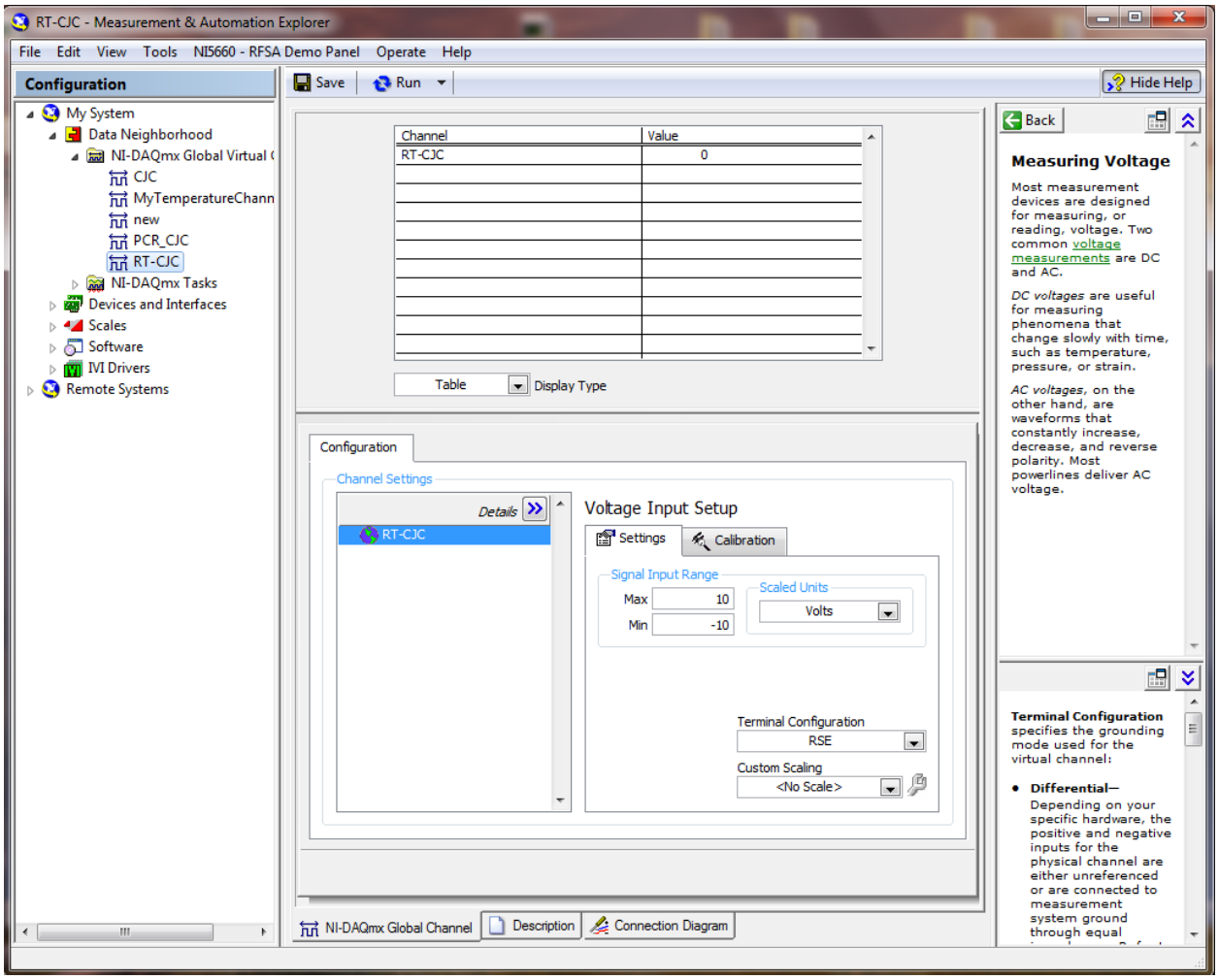


The dialog box appears which asks you to write a desired name for the global virtual channel.

We named **RT-CJC** and then click on **Finish**.



The following window appears.

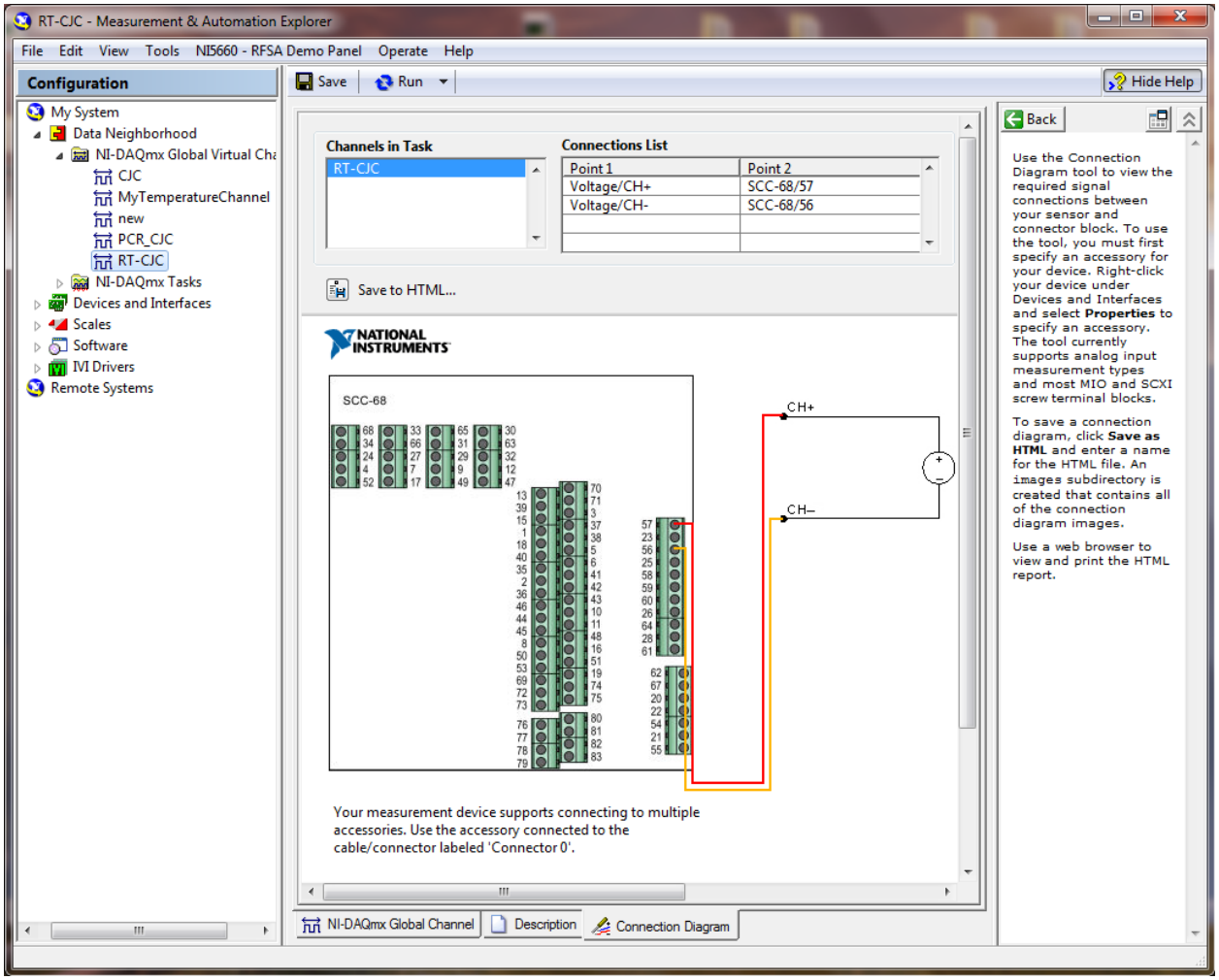


Make the **Terminal Configuration** to **RSE**, under the **Settings** tab, set the **signal Input Range** to Max 10 and Min -10. And select Volts as **Scaled Units**.

Click on the **Connection Diagram** tab, at the lower bottom of the dialog box.

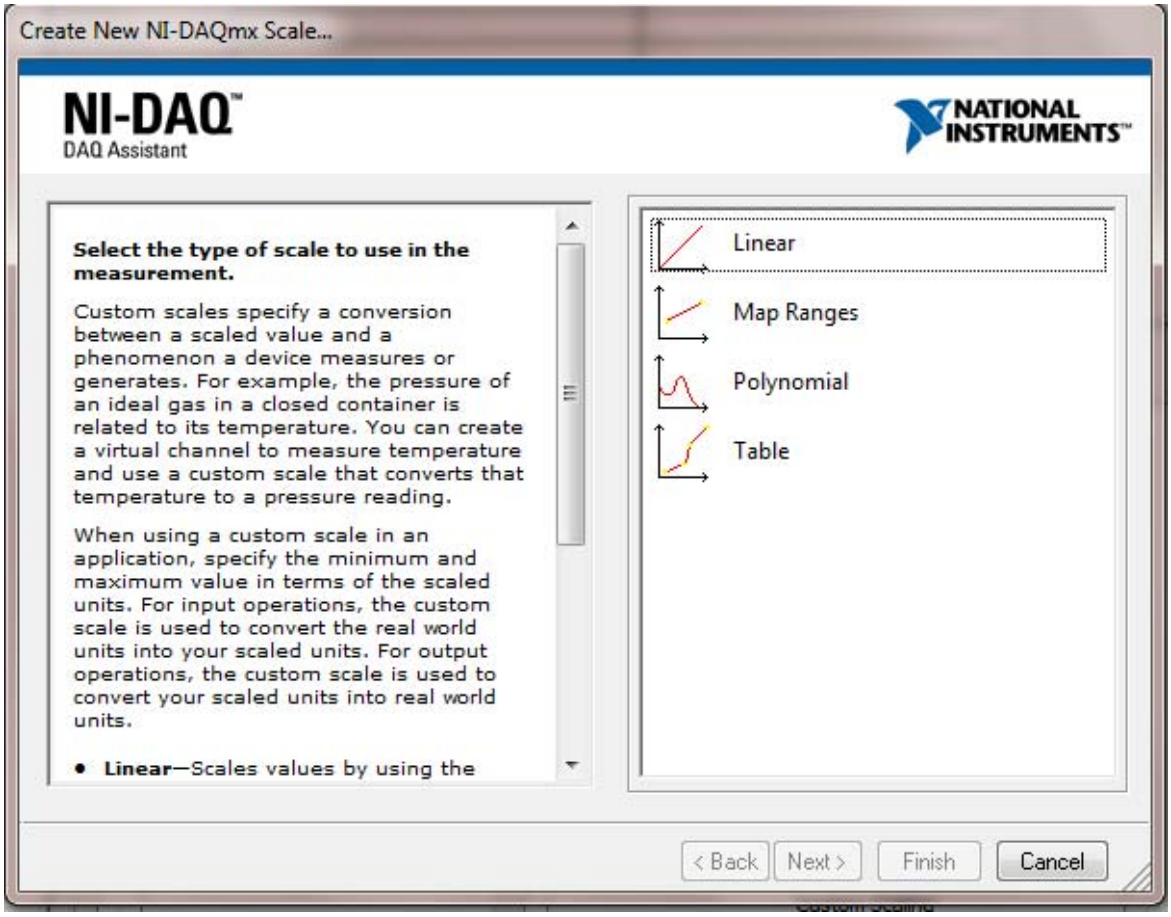
It shows you the connection diagram of the existing channel, which is shown below.

Make sure the connections on the diagram should be same as of the SCC-68.



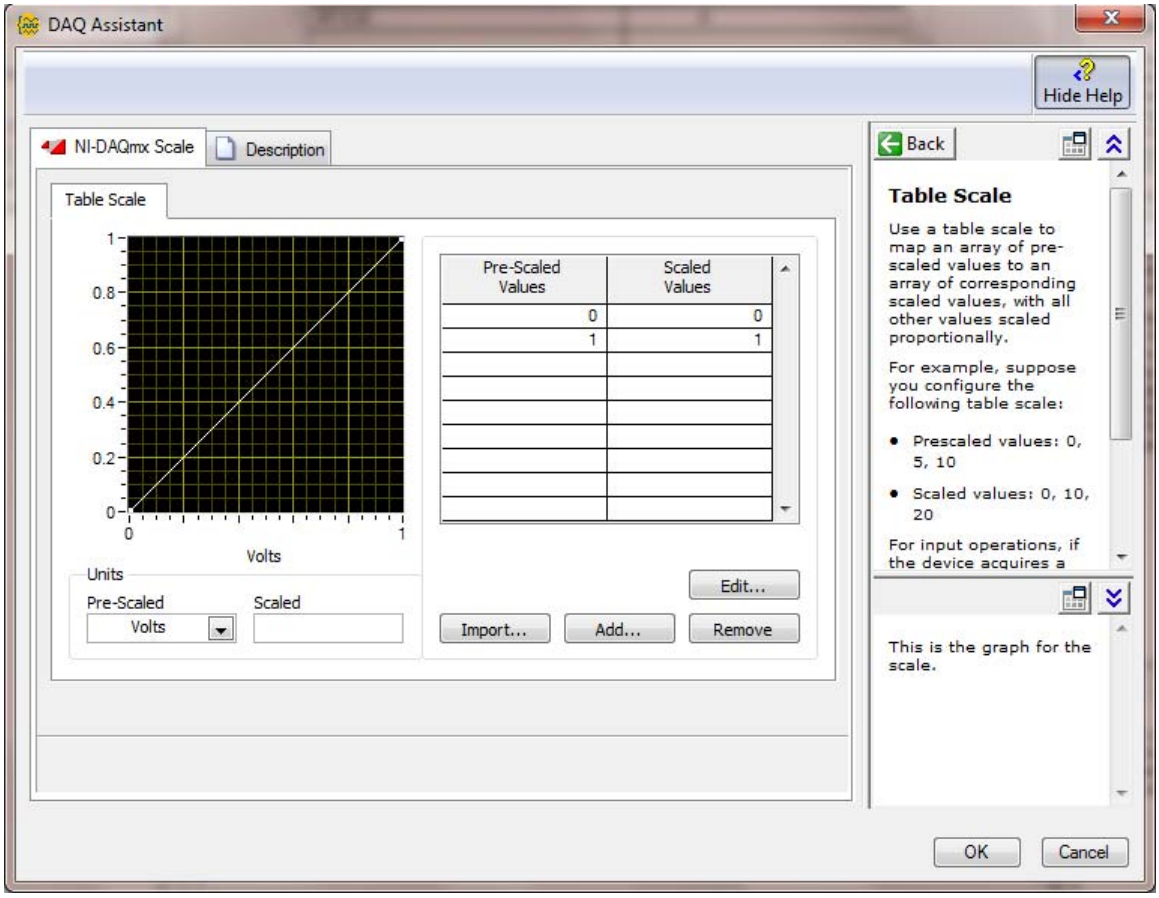
Now click on the **NI-DAQmx Global Channel** again, and under the **Voltage Input Setup**, scroll down **Custom Scaling** and select **Create New**.

Following Dialog box appears.

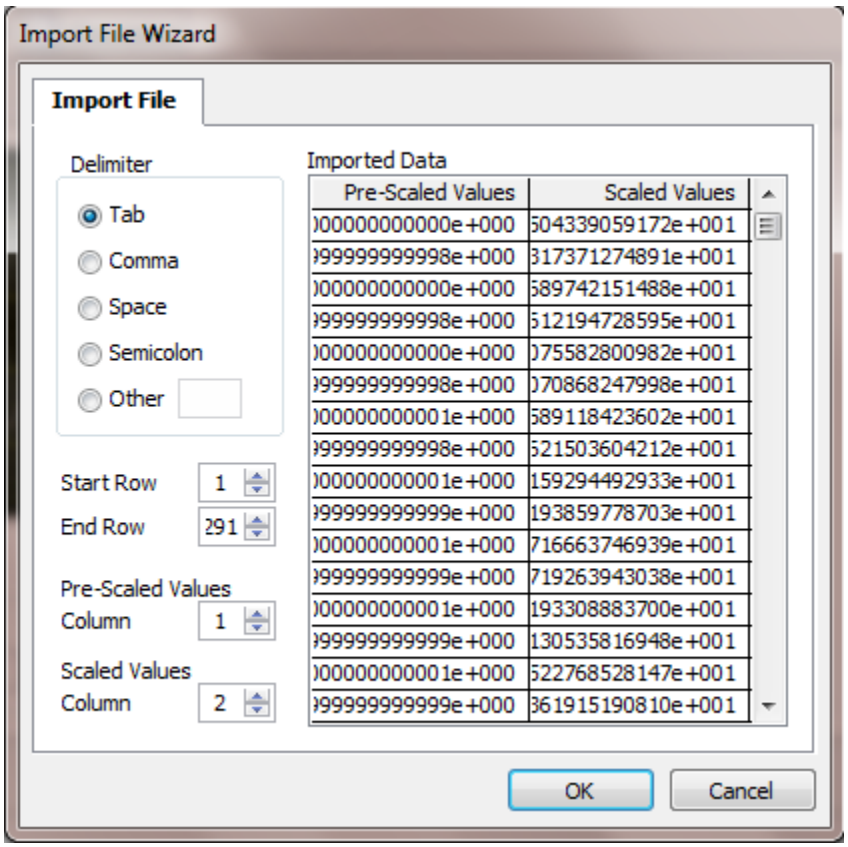


Click on **Table**, the following window asks you to enter the name of the scale, e.g. Steinhart-calibration

Click Finish, following dialog box appears.

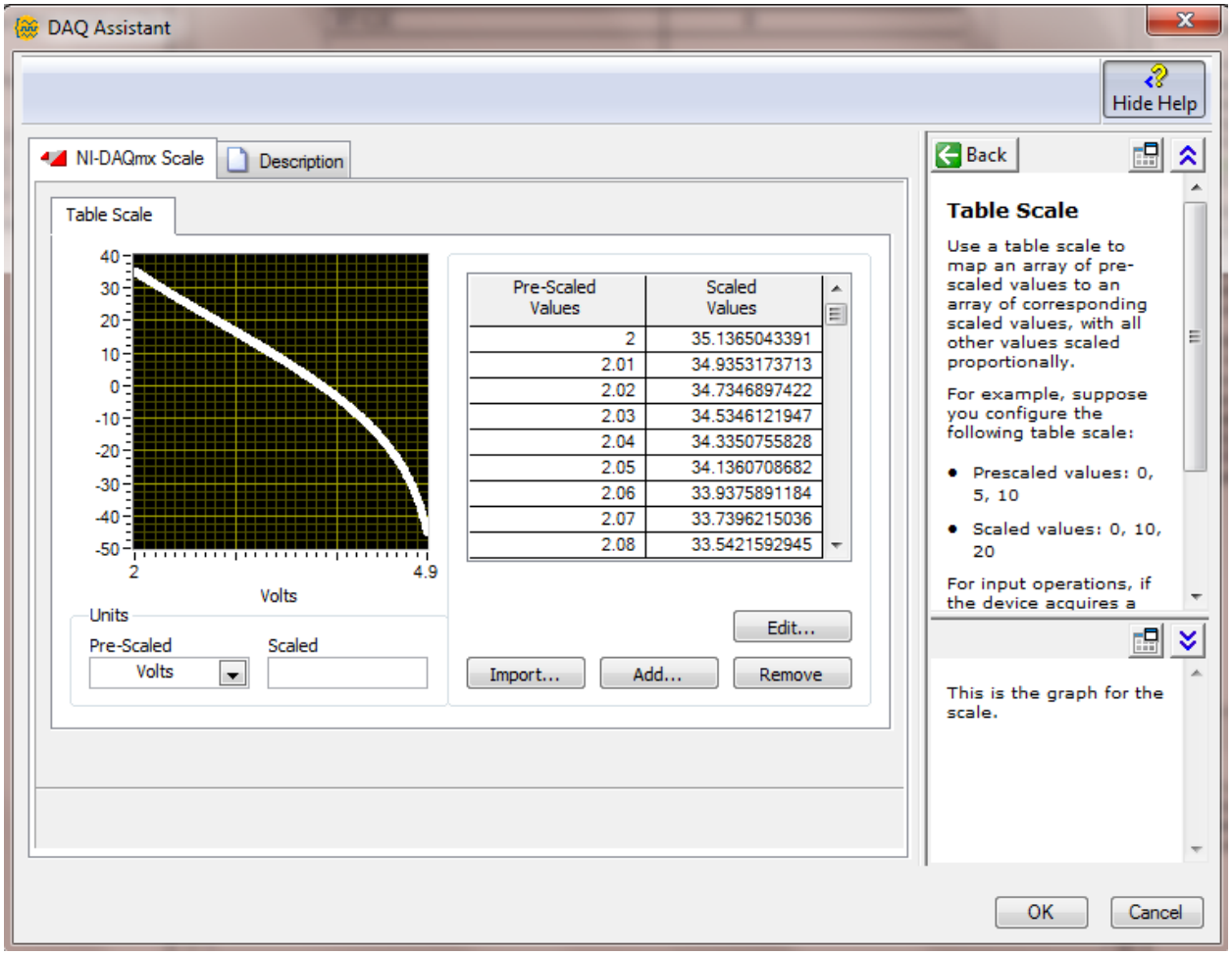


Click on **Import**, Now we have to import the calibration file **(Steinhart.txt)**, the import file wizard shows you the calibration table as follows,



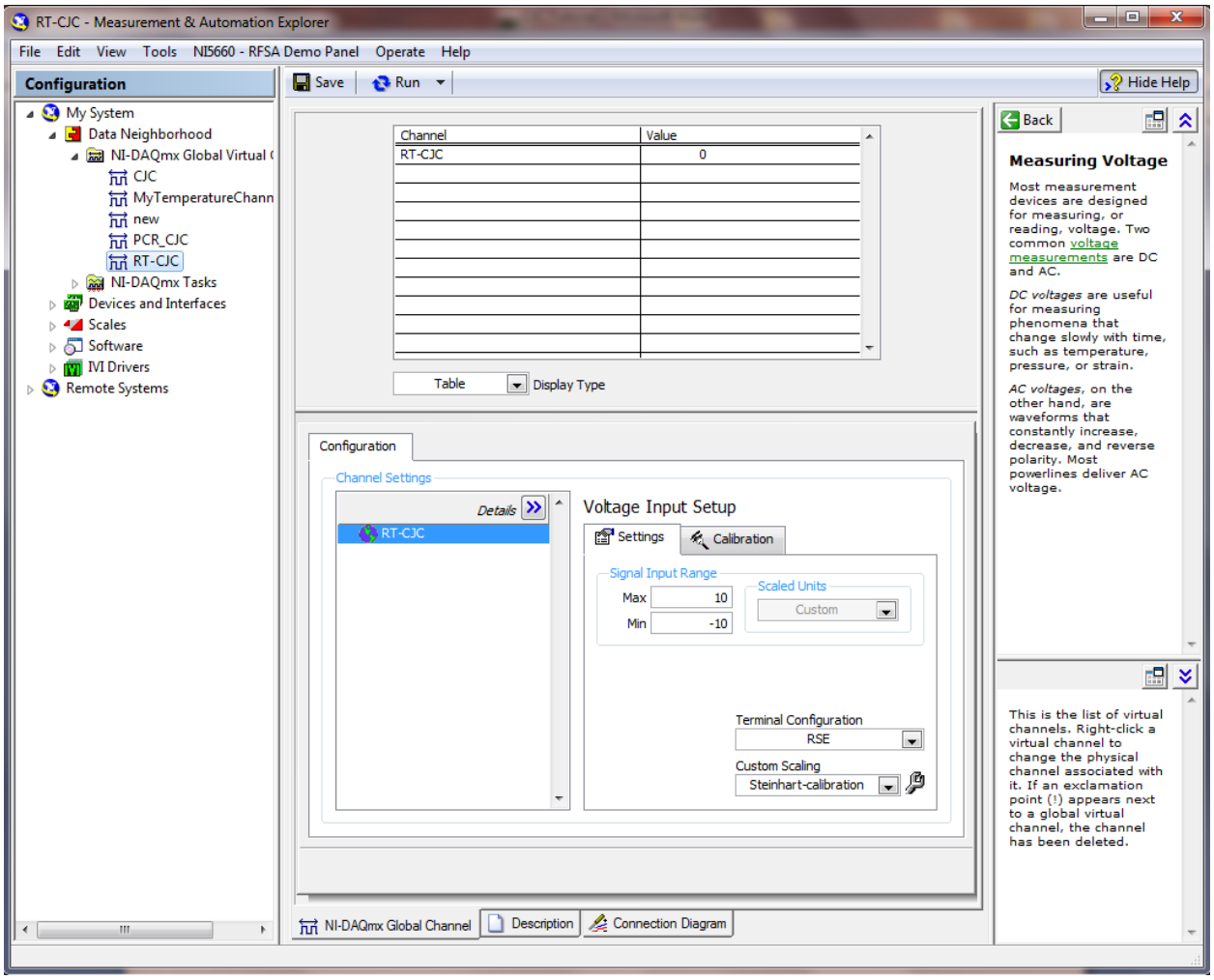
Click Ok.

The table has been added as shown below.



Click **OK**, now the **Custom Scaling** should read as **Steinhart-calibration.**

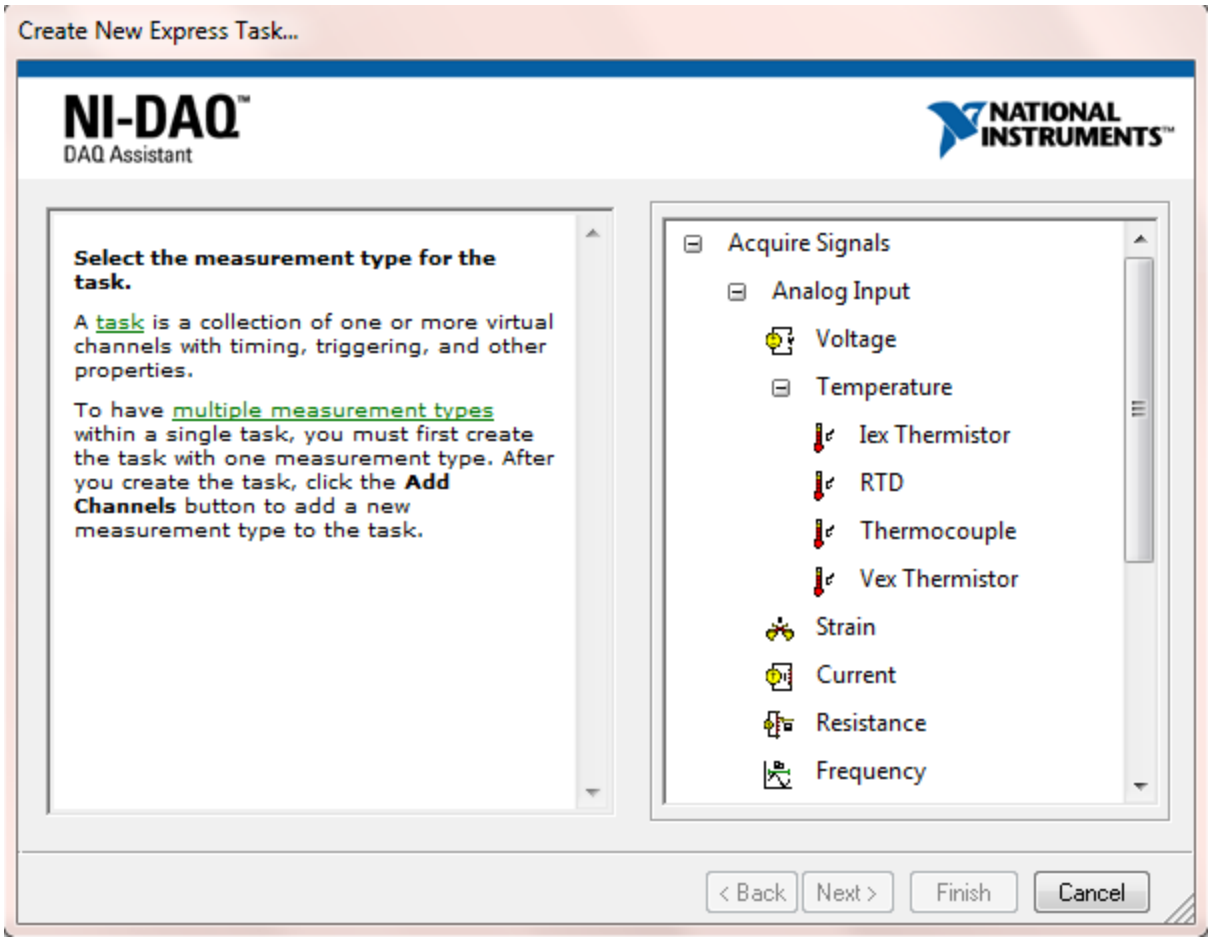
On the following dialog box, click **Save**.



A global virtual channel has been created; now close the **Measurement & Automation Explorer.**

Now go to LabVIEW, Open a new VI

In Block Diagram, place a **DAQ Assistant**, the following dialog box appears

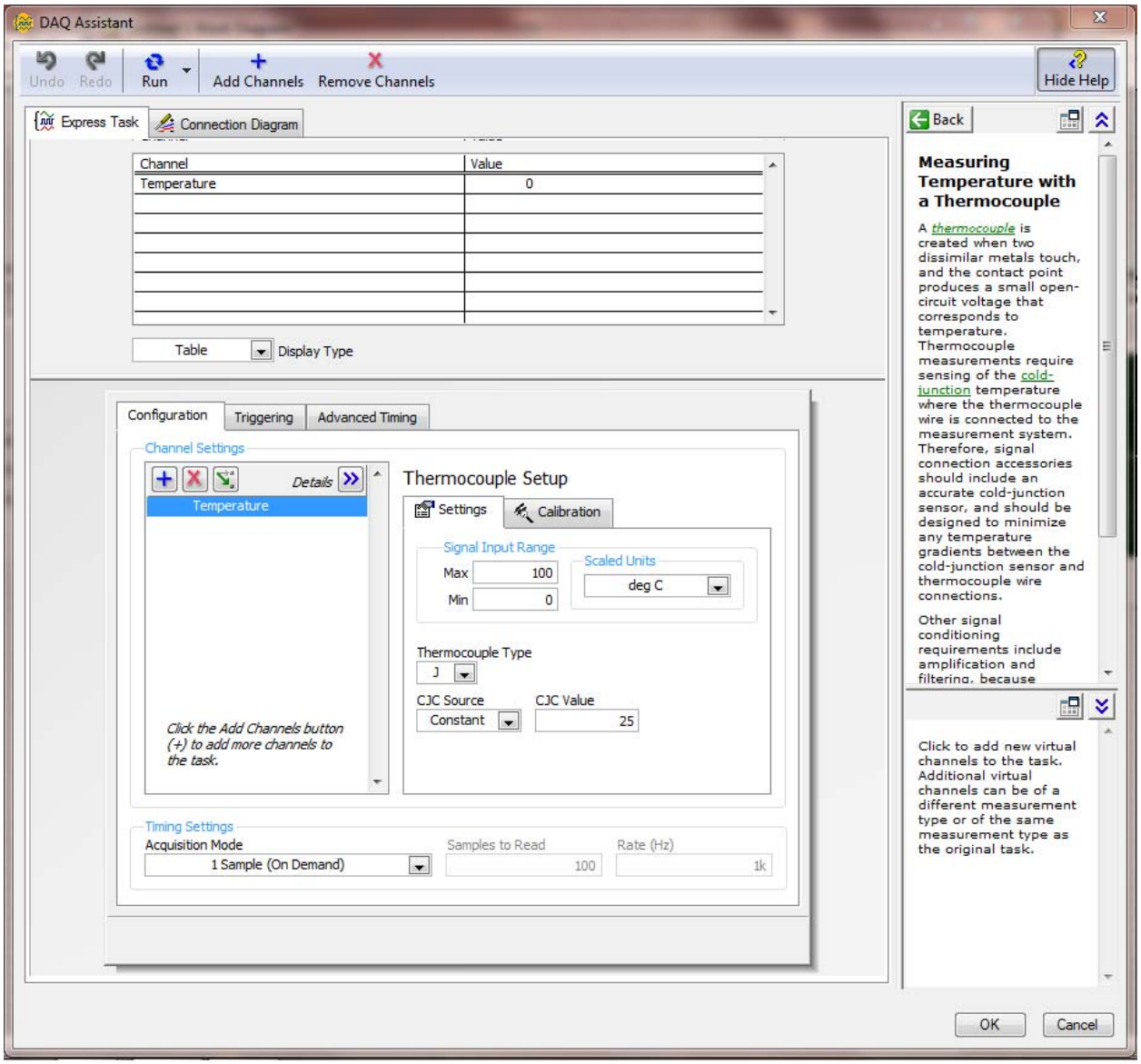


Select **Acquire Signals**, **Analog Input**, **and Temperature** and finally select **Thermocouple**.

Select the **physical channel**, at which you connected the thermocouple, let's say AI 0

Select the channel and click on finish.

Following dialog box appears



Under the **Thermocouple Setup**, set the following parameters as,

Signal Input range: The range of the input temperature you are acquiring

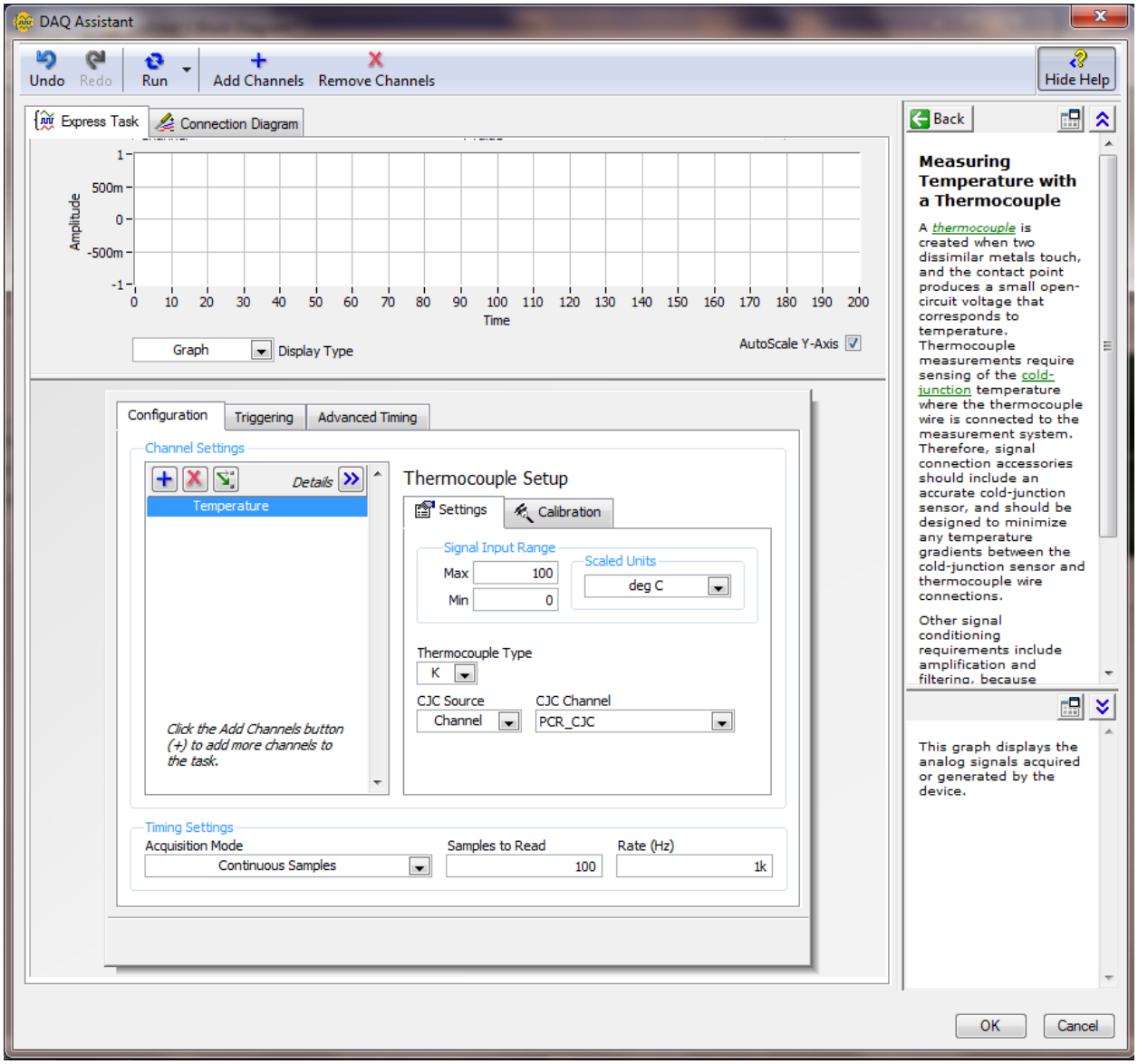
Scaled Units: The different temperature units (C, F, K)

Thermocouple Type: Select the type of the thermocouple which you are using (identified using color codes)

CJC Source: Define the CJC source as Constant, Channel, or Built in. For the real time cold junction compensation measurements, define it to Channel.

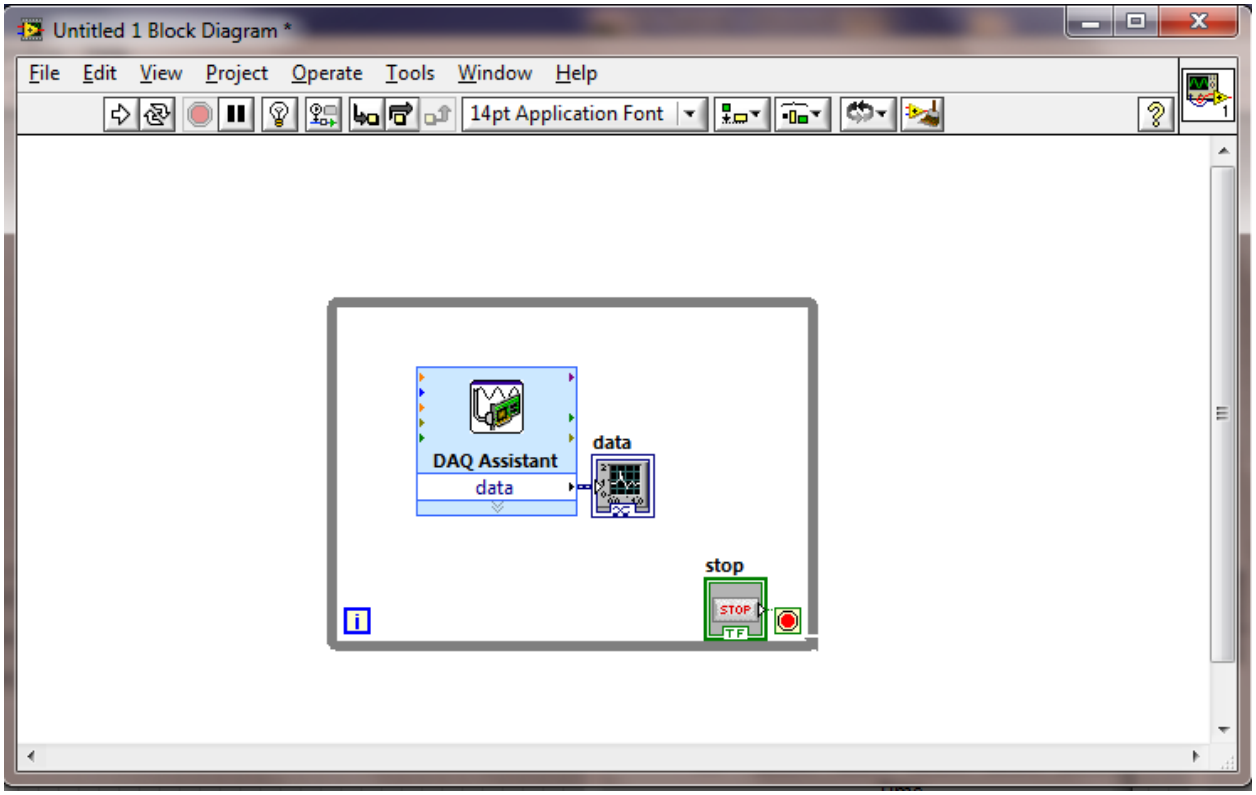
CJC Channel: Select the RT-CJC channel which we have just created

Acquisition Mode: Select this to Continuous samples.

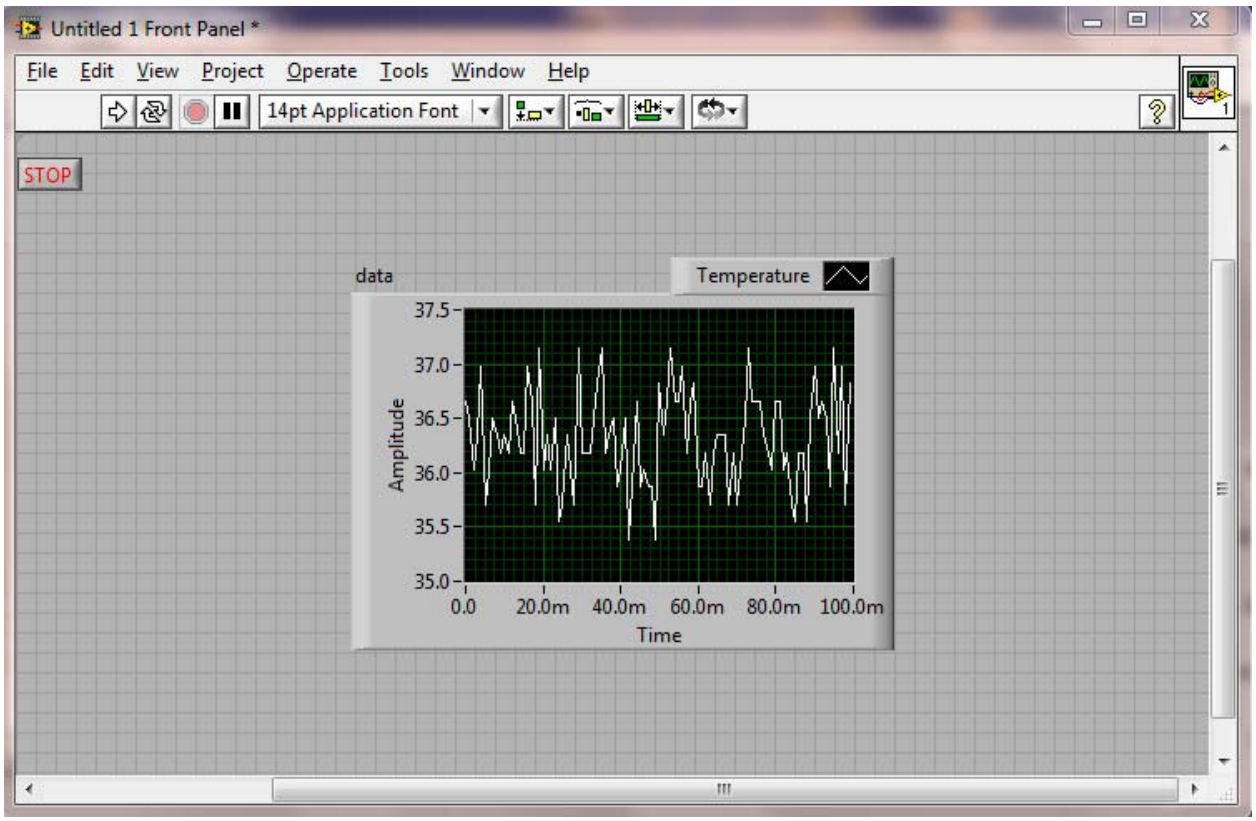


Click Ok.

Place a **Graph Indicator** at the output i.e. **Data** of the **DAQ assistant** and click on **Run button**. Place a while loop around it to continuously run the file, as shown,



Check the **Front Panel.**



Graph Indicator shows you the temperature while performing cold junction compensation in real time. Find the average of the acquired temperature for eliminating noise.

Important Note:

Turn the switch ON labeled as SW1 on SCC-68 Card. The light turned as the switch turns ON. This switch provides the power to the thermistor circuit which is performing the real time cold junction compensation.

Enjoy!!!!!!!!