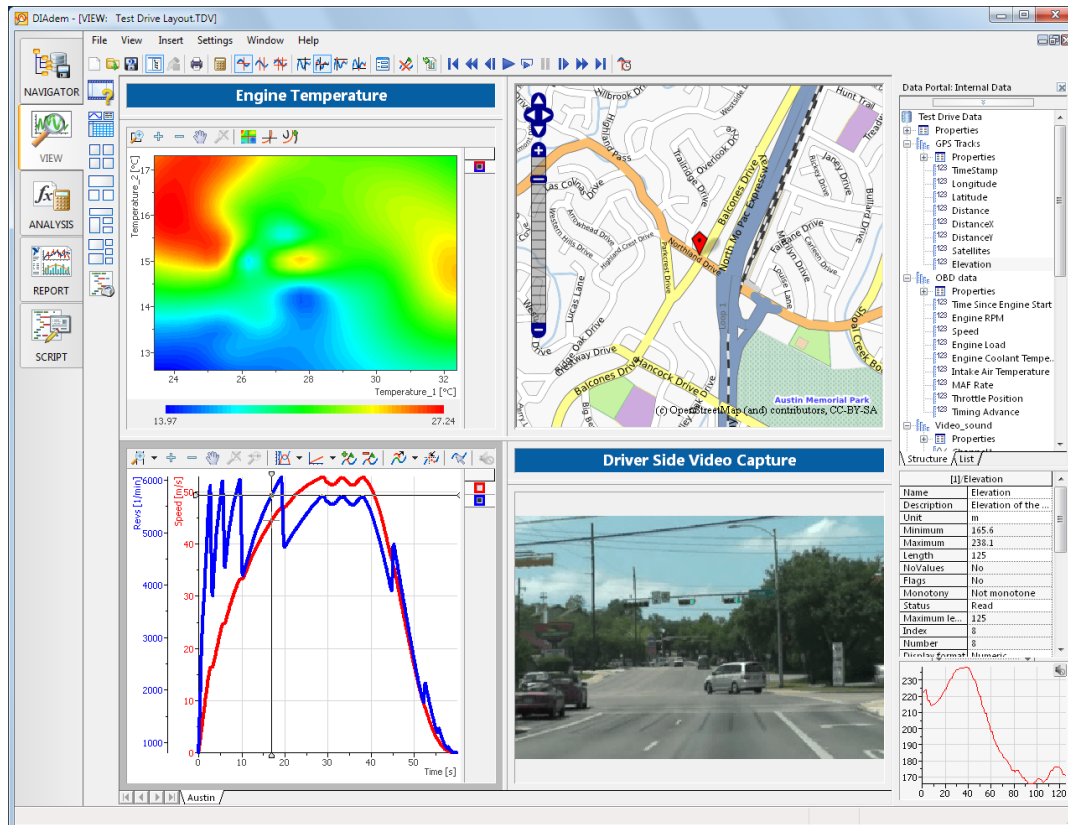


DIAdem for Offline Data Processing Hands-On



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Exercise 0 - Writing a TDMS File in LabVIEW

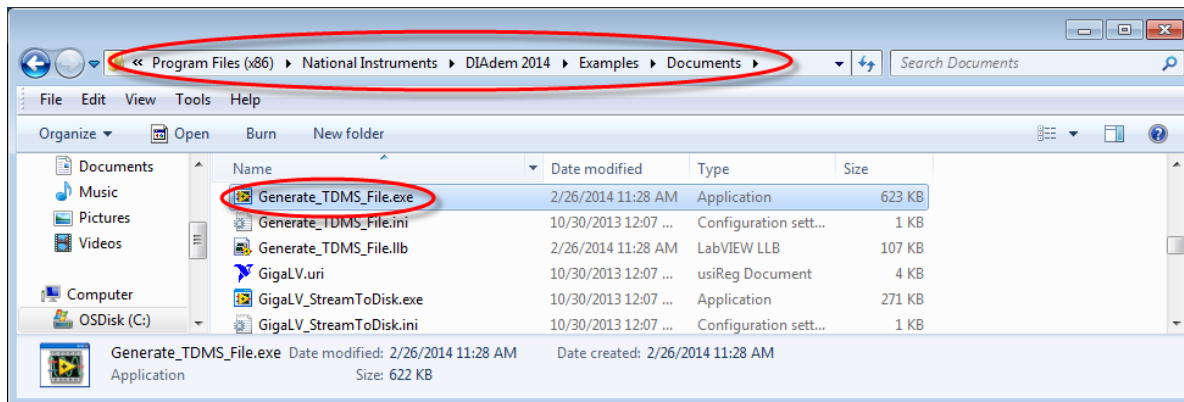
Scenario: You've been charged with finding or creating a data file format that your company can use to maximize productivity (or some other typically vague managerial request). You have heard that National Instruments has a good default file format and claims to offer "Data Management", whatever that is. You decide to take a closer look and see if what NI has to offer is a fit for you. In this exercise you will inspect and use the LabVIEW functions for writing TDMS data files which, in addition to the data values, also contain key information that can be searched on later. You will use the TDM Add-in to load these TDMS files into OpenOffice Calc to verify openness and portability. Finally, you will find the TDMS files you have created by running a simple search in DIAdem and immediately see a graphical preview of the data channels you stored.

NOTE: LabVIEW is NOT required for this exercise-- DIAdem 2014 is sufficient. If, however, the *.vi file below does not open for you, re-run the DIAdem 2014 installer and choose to install the LabVIEW Runtime Engine option.

- 0.0** Your first task is to load a LabVIEW example that actually ships with DIAdem. Launch Windows Explorer to find and run the LabVIEW example. If you took all the defaults when installing DIAdem, you will find the LabVIEW example in the following folder on your hard drive:
"C:\Program Files\National Instruments\DIAdem 2014\Examples\Documents"

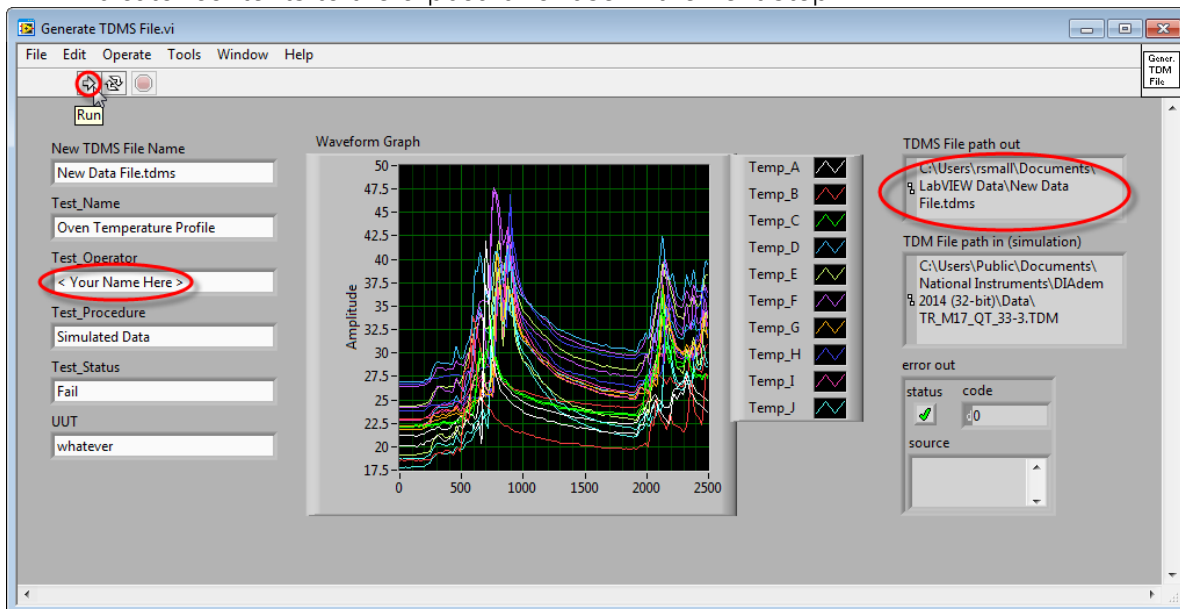
The LabVIEW example you need to launch is called "Generate_TDMS_File.exe". Double-click the **"Generate_TDMS_File.exe"** LabVIEW application to launch it.

(On 64 bit operating systems you must use the **"Program Files (x86)"** folder)

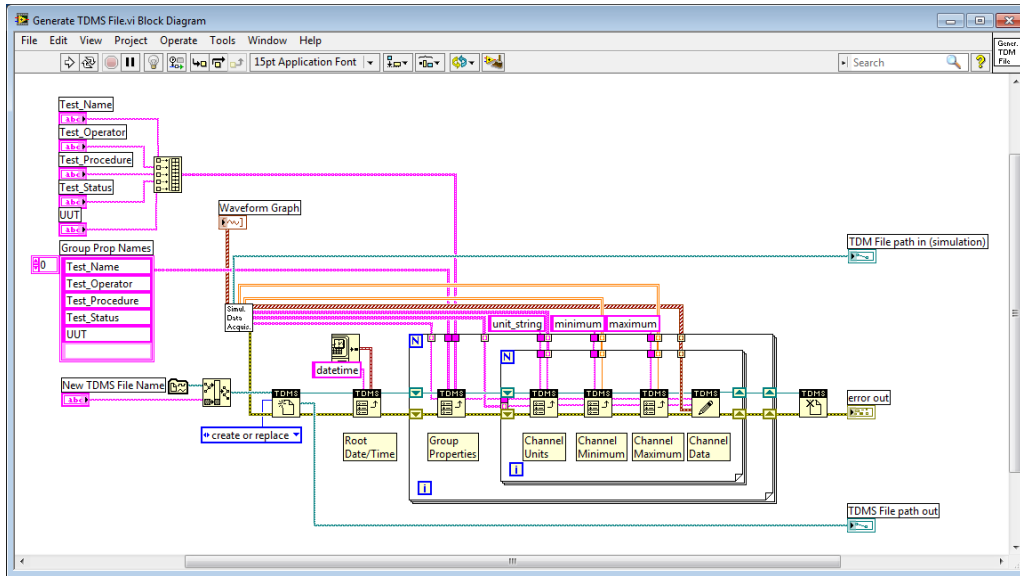


NOTE: DIAdem optionally installs the LabVIEW run-time engine— this is why you do not need to have LabVIEW installed in order to run this compiled LabVIEW application. If you have a recent version of LabVIEW installed and want to look at the source code for this example, you can double-click on the “Generate_TDMS_File.llb” (also shown in the dialog above) and select the main “Generate TDMS File.vi”, from which the executable was compiled.

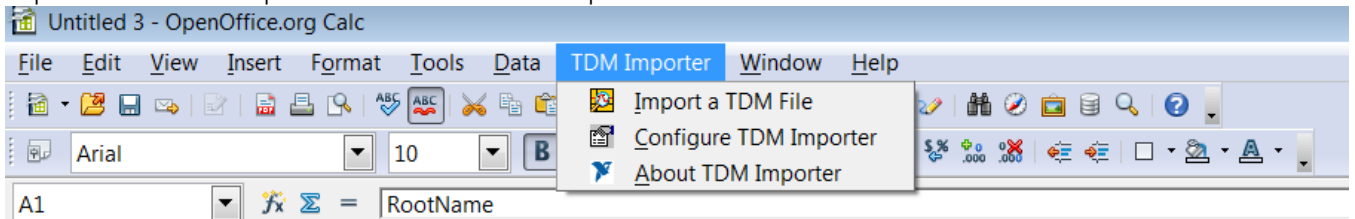
- 0.1** This LabVIEW application runs as soon as you launch it— that’s why you see data already in the “Waveform Graph”. This application simulates the acquisition of 20 channels of temperature data, showing you different data curves each time you run it— this is why the data on your graph is not identical to the data in the screenshot below. This application also saves useful descriptive information with the data values, giving you the ability to change the values written to the “Test_Name”, “Test_Operator”, “Test_Procedure”, “Test_Status”, and “UUT” properties. **Change the “Test_Operator” property value to be your own name, then click on the white arrow icon at the top left of the application to run it again, causing a new file to be created with your name stored in the “Test_Operator” property. Finally, copy the resulting “TDMS File path out” indicator contents to the clipboard for use in the next step.**



NOTE: You may change as many property values as you want and run this VI as many times as you want, but be aware that if you leave the “New TDMS File Name” field unchanged and re-run the application, it will automatically overwrite the old file with the new data values and new property values. Below is this VI’s source code:



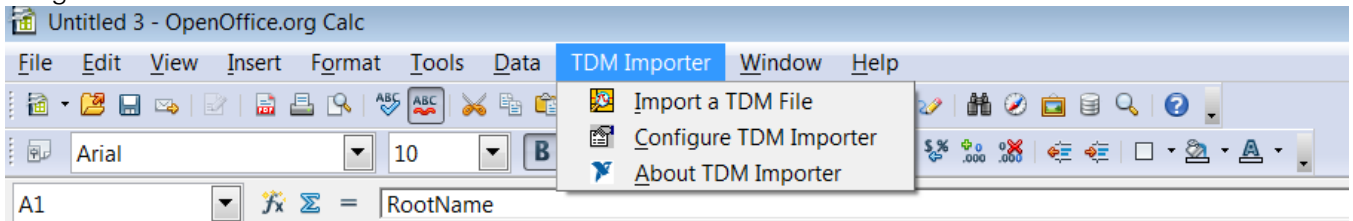
- 0.2 One of the stated benefits of the TDMS data file format is that it can be read into Microsoft Excel using a free “TDM Excel Add-in” or into OpenOffice Calc using “TDM Add-In for OpenOffice”. You decide to check this out by trying to read into OpenOffice Calc the TDMS file(s) you just created in the previous step. Using Microsoft Excel would be very similar.
- 0.3 Locate the OpenOffice Calc icon on your Desktop and run it. The TDM Add-In for OpenOffice has been already installed for you.
- 0.4 Expand the TDM Importer menu and click Import a TDM File



- 0.5 **Navigate** to the folder “...Documents\LabVIEW Data” and **right-click** on the **TDMS file** you created and click Open.
- 0.6 The TDMS file you created opens in OpenOffice Calc, and you can quickly find your name in the Test_Operator field for both channel groups (cell E5 and E6).

	A	B	C	D	E	F	G	H	I	J	K
1	RootName	Description	Title	Author	Date/Time	Groups					
2	data_ros				2014-09-16 15:00:56	2					
3											
4	GroupName	Description	Channels	Test_Name	Test_Operator	Test_Procedure	Test_Status	UUT			
5	QT_33-5_Lower		10 Oven Temperature Profile	Rostislav	Simulated Data	Fail	whatever				
6	QT_33-5_Upper		10 Oven Temperature Profile	Rostislav	Simulated Data	Fail	whatever				
7											
8	QT_33-5_Lower										
9	ChannelName	Description	Datatype	Unit	Length	Minimum	Maximum	displaytype	Limit_High	Limit_Low	monotony
10	Temp_A		DT_DOUBLE	°C	250	17,85	27,99	Numeric	50	20	not monotone
11	Temp_B		DT_DOUBLE	°C	250	24,41	34,6	Numeric	50	20	not monotone
12	Temp_C		DT_DOUBLE	°C	250	24,84	33,84	Numeric	50	20	not monotone
13	Temp_D		DT_DOUBLE	°C	250	24,48	31,78	Numeric	50	20	not monotone
14	Temp_E		DT_DOUBLE	°C	250	27,4	42,49	Numeric	50	20	not monotone
15	Temp_F		DT_DOUBLE	°C	250	25,72	47,82	Numeric	50	20	not monotone
16	Temp_G		DT_DOUBLE	°C	250	20,43	37,59	Numeric	50	20	not monotone
17	Temp_H		DT_DOUBLE	°C	250	22,95	37,23	Numeric	50	20	not monotone
18	Temp_I		DT_DOUBLE	°C	250	26,79	37,62	Numeric	50	20	not monotone
19	Temp_J		DT_DOUBLE	°C	250	26,63	35,13	Numeric	50	20	not monotone
20											
21	QT_33-5_Upper										
22	ChannelName	Description	Datatype	Unit	Length	Minimum	Maximum	displaytype	Limit_High	Limit_Low	monotony
23	Temp_A		DT_DOUBLE	°C	250	23,4	31,25	Numeric	50	20	not monotone
24	Temp_B		DT_DOUBLE	°C	250	20,37	29,25	Numeric	50	20	not monotone
25	Temp_C		DT_DOUBLE	°C	250	19,66	26,73	Numeric	50	20	not monotone
26	Temp_D		DT_DOUBLE	°C	250	23,89	30,09	Numeric	50	20	not monotone
27	Temp_E		DT_DOUBLE	°C	250	20,39	31,91	Numeric	50	20	not monotone
28	Temp_F		DT_DOUBLE	°C	250	19,3	37,29	Numeric	50	20	not monotone
29	Temp_G		DT_DOUBLE	°C	250	18,8	32,23	Numeric	50	20	not monotone
30	Temp_H		DT_DOUBLE	°C	250	22,18	33,73	Numeric	50	20	not monotone
31	Temp_I		DT_DOUBLE	°C	250	24,8	34,05	Numeric	50	20	not monotone
32	Temp_J		DT_DOUBLE	°C	250	19,57	27,1	Numeric	50	20	not monotone

- 0.7 The TDM Add-in imports all the file, group, and channel properties into the “New Data File (root)” worksheet, shown below. Note that your TDMS file has a date/time property in cell E2 and Unit, Minimum, and Maximum properties for each channel, etc. Each group in the TDMS file is assigned to its own

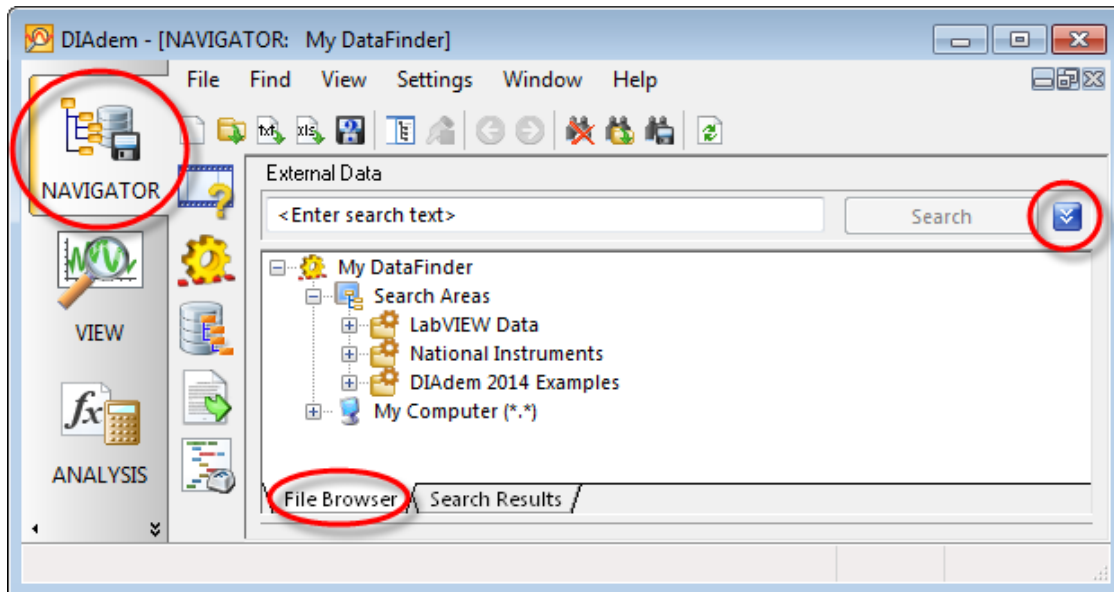


Worksheet where all its channel values are imported as columns. Click on the “...Lower” worksheet to view its channel values

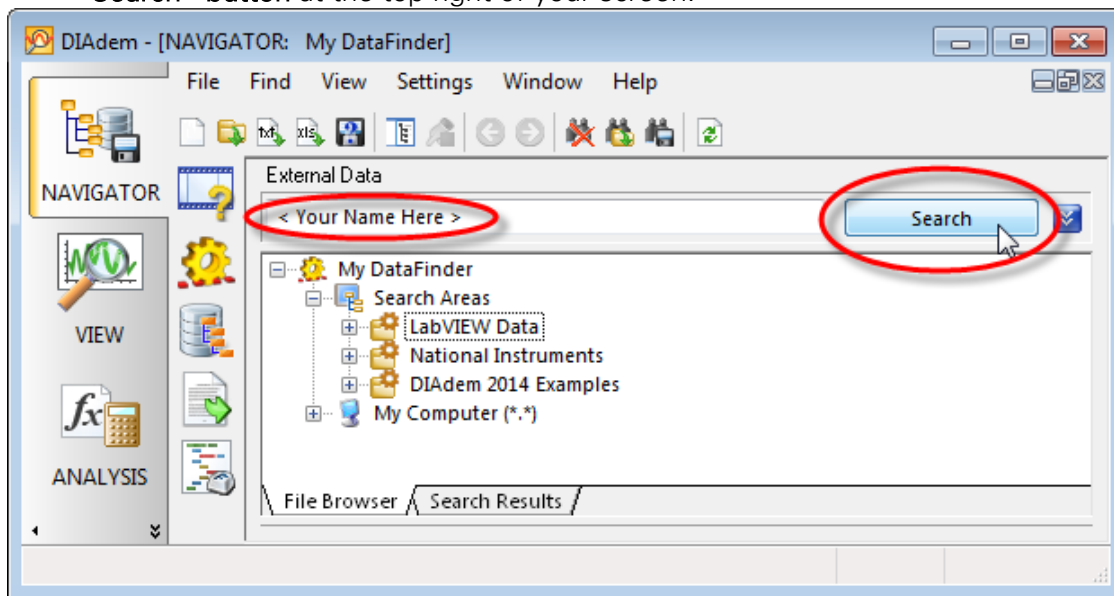
- 0.8 Here you see that all the channel values you saw graphed in the LabVIEW application are faithfully loaded into OpenOffice Calc. It appears that you really can load TDMS files into OpenOffice Calc or Microsoft Excel—which means you can send them to anybody without having to first convert to an ASCII file format.

	A	B	C	D	E	F	G	H	I	J
1	Temp_A	Temp_B	Temp_C	Temp_D	Temp_E	Temp_F	Temp_G	Temp_H	Temp_I	Temp_J
2	17.85	24.43	24.84	24.49	27.41	25.72	20.48	22.95	26.79	26.63
3	17.91	24.45	24.87	24.48	27.41	25.75	20.51	22.95	26.81	26.66
4	17.95	24.48	24.89	24.49	27.41	25.77	20.53	22.95	26.84	26.68
5	17.96	24.5	24.89	24.51	27.4	25.78	20.51	22.95	26.86	26.68
6	17.95	24.52	24.89	24.54	27.4	25.81	20.49	22.95	26.89	26.68
7	17.94	24.54	24.89	24.53	27.44	25.86	20.47	22.96	26.89	26.68
8	17.94	24.54	24.89	24.5	27.49	25.91	20.48	22.99	26.89	26.69
9	17.96	24.52	24.89	24.48	27.51	25.92	20.48	23.01	26.89	26.67
10	17.98	24.49	24.89	24.48	27.48	25.89	20.48	23.04	26.89	26.63
11	17.95	24.48	24.99	24.49	27.46	25.86	20.48	23.05	26.89	26.64
12	18.06	24.5	25.15	24.51	27.45	25.86	20.49	23.06	26.9	26.69
13	19.56	24.47	25.31	24.55	27.46	25.87	20.48	23.05	26.89	26.73
14	22.44	24.41	25.42	24.6	27.46	25.9	20.45	23.02	26.86	26.73
15	25.55	24.53	25.49	24.64	27.46	25.92	20.43	23	26.84	26.73
16	27.51	25	25.55	24.64	27.48	25.92	20.45	23.02	26.85	26.78
17	27.99	25.71	25.59	24.64	27.51	25.92	20.51	23.05	26.88	26.83
18	26.79	26.55	25.57	24.66	27.52	25.92	20.63	23.05	26.92	26.83
19	25.09	27.74	25.51	24.71	27.55	25.92	20.74	23.05	26.97	26.83
20	23.71	29.8	25.45	24.8	27.6	25.91	20.83	23.06	27.03	26.85
21	22.96	32	25.36	24.92	27.63	25.91	20.85	23.09	27.08	26.9
22	22.34	33.81	25.21	25.07	27.56	25.94	20.79	23.11	27.09	26.95
23	21.76	34.51	25.1	25.27	27.49	26.04	20.73	23.12	27.09	26.94
24	21.32	34.6	25.48	25.54	27.75	26.17	20.85	23.17	27.1	26.92
25	21.1	34.25	26.74	25.82	28.66	26.29	21.42	23.24	27.34	26.91
26	21.12	33.59	28.95	25.82	30.17	26.25	22.65	23.18	28.41	27.01
27	21.34	32.75	31.86	25.6	32.08	26.06	24.44	23	30.31	27.26
28	21.65	31.88	33.84	26.22	33.35	26.24	25.77	23.2	31.97	27.58
29	21.94	31.12	33.72	28.49	33.25	27.29	25.92	24.17	32.54	27.99
30	22.13	30.54	32.42	30.68	31.72	29.94	25.02	25.54	31.95	28.83
31	22.18	30.22	31.37	31.78	30.18	33.96	24.01	26.74	31.01	30.44
32	22.23	29.97	30.66	31.39	30.05	37.1	23.28	27.35	30.34	32.01
33	22.54	29.65	29.99	30.88	34.96	36.11	24.12	26.82	31.44	32.35
34	22.94	29.3	29.36	30.37	40.91	33.76	25.24	26.07	33.05	32.11
35	23.31	28.98	28.85	29.91	42.49	36.03	26.12	26.3	34.44	32.25
36	23.42	28.76	28.52	29.48	39.21	41.78	25.85	27.64	34.57	32.88
37	23.36	28.56	28.26	29.13	35.88	47.35	25.42	29.06	34.43	33.47
38	23.22	28.37	28.05	28.88	35.32	47.82	25.76	29.42	34.27	33.31
39	23.15	28.2	27.86	28.72	35.53	45.62	28.62	28.41	34.18	32.9
40	23.26	28.05	27.69	28.59	34.88	42.06	33.92	26.55	34.08	32.55
41	23.2	27.99	27.54	28.29	33.9	28.83	27.59	27.92	23.86	23.59

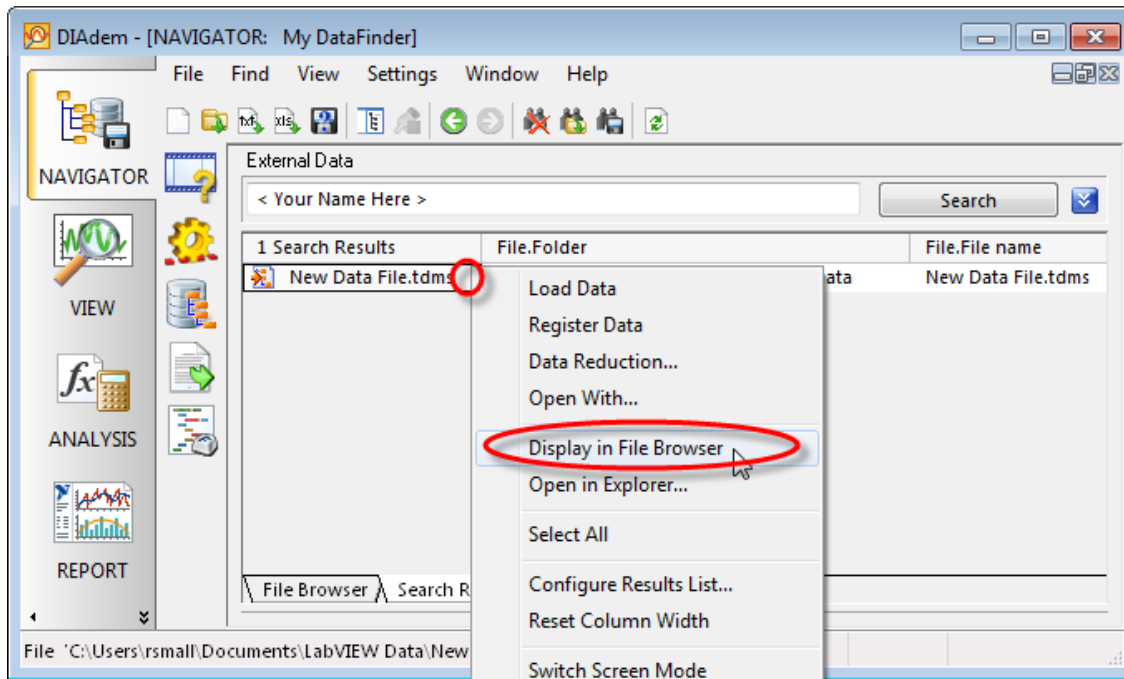
Now you decide to try out DIAdem, to see if it is any better than Calc or Excel. Launch DIAdem (the icon is located on Desktop) and make sure that the “**NAVIGATOR**” tab at the top left of your screen is selected. Next make sure the “**File Browser**” tab is selected at the bottom left of your screen. Finally, if you don’t see the **simple search bar** (pictured below with the text “<Enter text to find in search areas>”), then click on the toggle button at the top right of your screen to switch back to the simple search shown below.



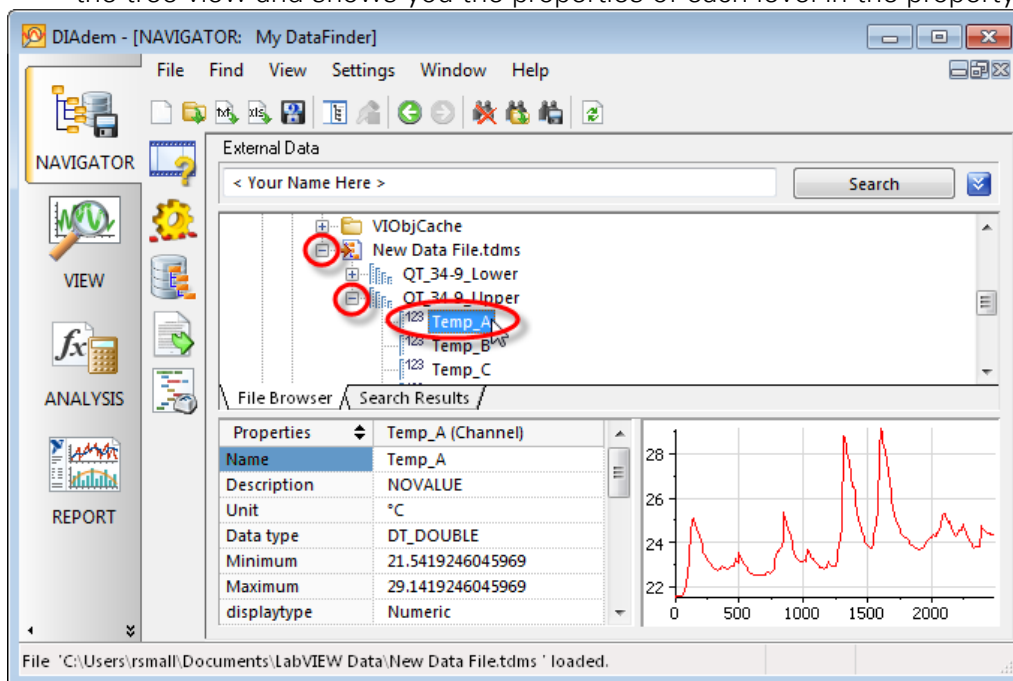
- 0.9 DIAdem has already noticed the TDMS files you created and indexed them into its built-in “DataFinder” data base. You don’t have to pop up a file dialog or know the exact folder to navigate to. Just **type in your name in the simple search text**, where the “< Your Name Here >” text is located below (exactly as you typed it in the LabVIEW application), and **click on the “Search” button** at the top right of your screen.



- 0.10 DIAdem should find all the TDMS files you created, plus any others which have your name as a property value somewhere. **Right-click on one of your TDMS files and select the context menu "Display in File Browser"** so that DIAdem will show you where this TDMS file is located in the NAVIGATOR tree view.



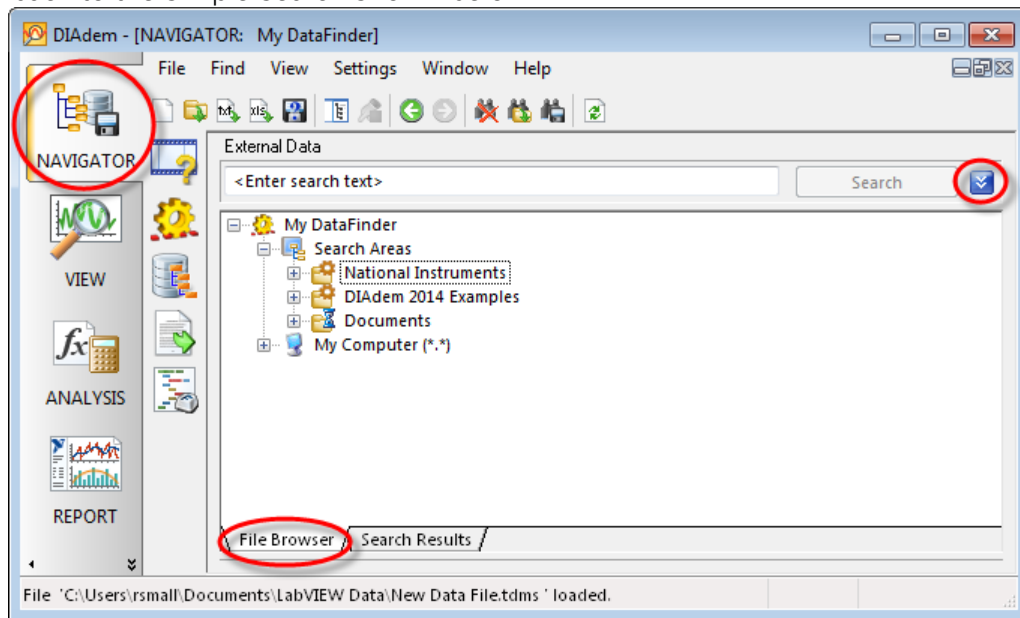
- 0.11 DIAdem highlights in the tree view the file you found with your simple search. Now **open up this file down to the channel level** - click on the "+" sign to the left of the file, then click on the "+" sign to the left of the file's "...Upper" group. Click on the first channel, called "Temp_A", to see a graphical preview of that channel. Notice how DIAdem shows you the 3 level hierarchy right in the tree view and shows you the properties of each level in the property table below it.



Exercise 1 - DataFinding and Automated Reporting

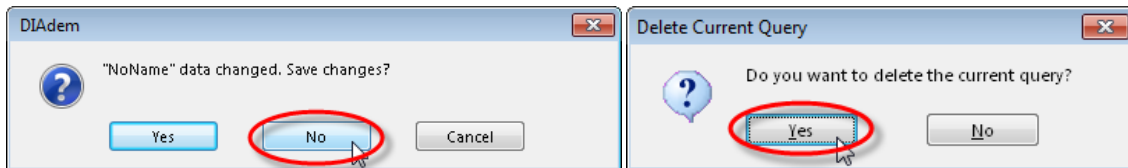
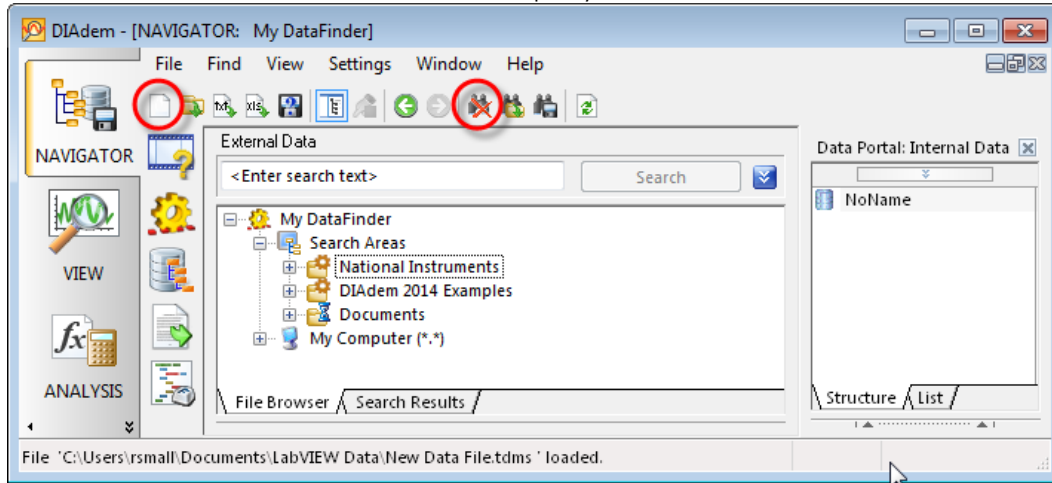
Scenario: You've been charged with finding out why so many tests show furnace temperatures exceeding their allowable thermal profiles. You know a few key facts about these data files, but over time the files have been stored in different folders by lots of different people, and it's not obvious where all the data is located. You will use the DataFinder to locate all the files which contain out-of-range temperature data. You will install and use a predefined custom menu in DIAdem (that a colleague of yours sent you) to automatically calculate histograms of the out-of-range temperatures. You will use another predefined custom menu (from this same colleague) to create a trend graph of the out-of-range temperatures. Finally you will output these graphs to a PDF file so that you can email your initial findings to your boss.

- 1.1 First get ready to search in DIAdem. Make sure that the "NAVIGATOR" tab at the top left of your screen is selected. Next make sure the "File Browser" tab is selected at the bottom left of your screen. Finally, if you don't see the **simple search bar** (pictured below with the text "<Enter text to find in search areas>"), then click on the toggle button at the top right of your screen to switch back to the simple search shown below.

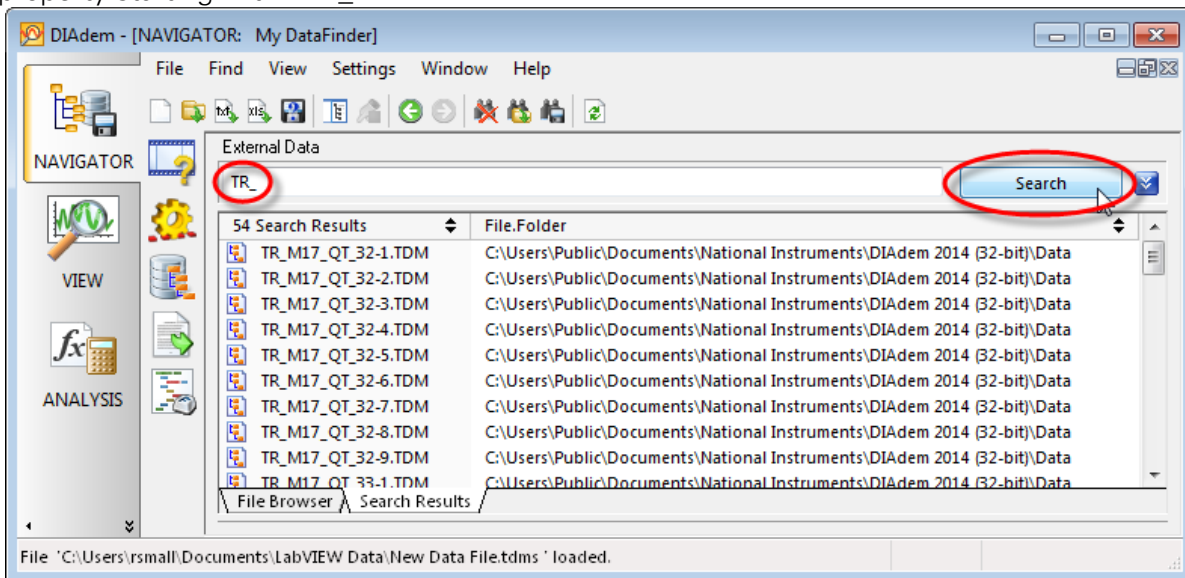


- 1.2 Click on the "Delete Internal Data" icon at the top left of your screen to delete any data currently loaded in DIAdem. Notice that now the Data Portal to the right of your screen is empty. Click on the "Delete Query" icon (binocular with red X) at the top of your screen to reset the DataFinder

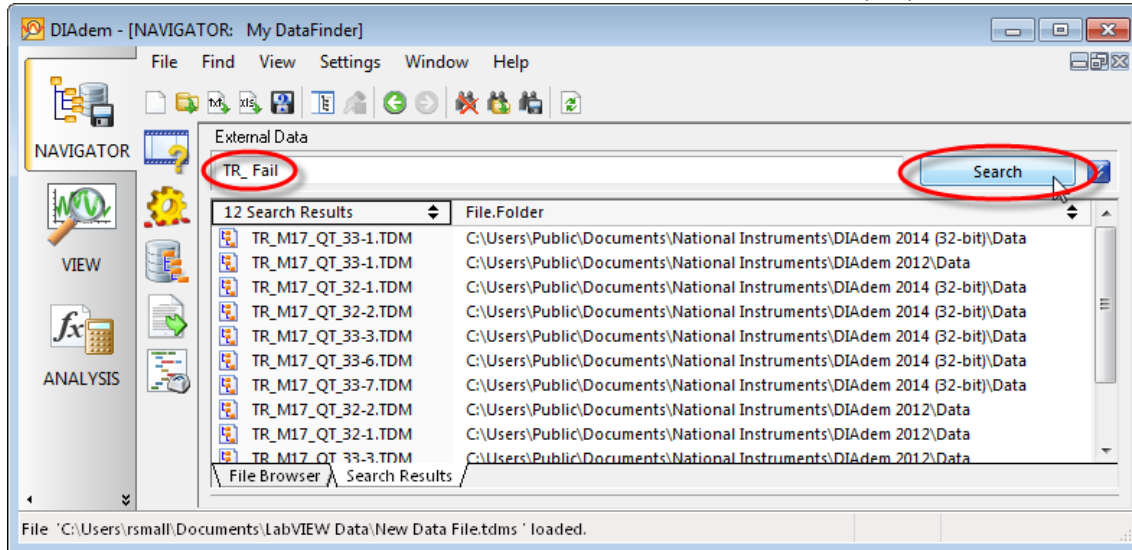
query to the empty query pictured below. Click the “No” button if asked to save data changes and the “Yes” button if asked to confirm the query deletion.



- 1.3 One thing you know about all these data files is they all have file names starting with “TR_”. **Type** the text “TR_” into the simple search keyword field and either hit the <Enter> key on your keyboard or **click** on the “Search” button to the right of the search text. Now you see a list of data files from all over your hard drive, or perhaps also mapped network drives, which have a property starting with “TR_”.

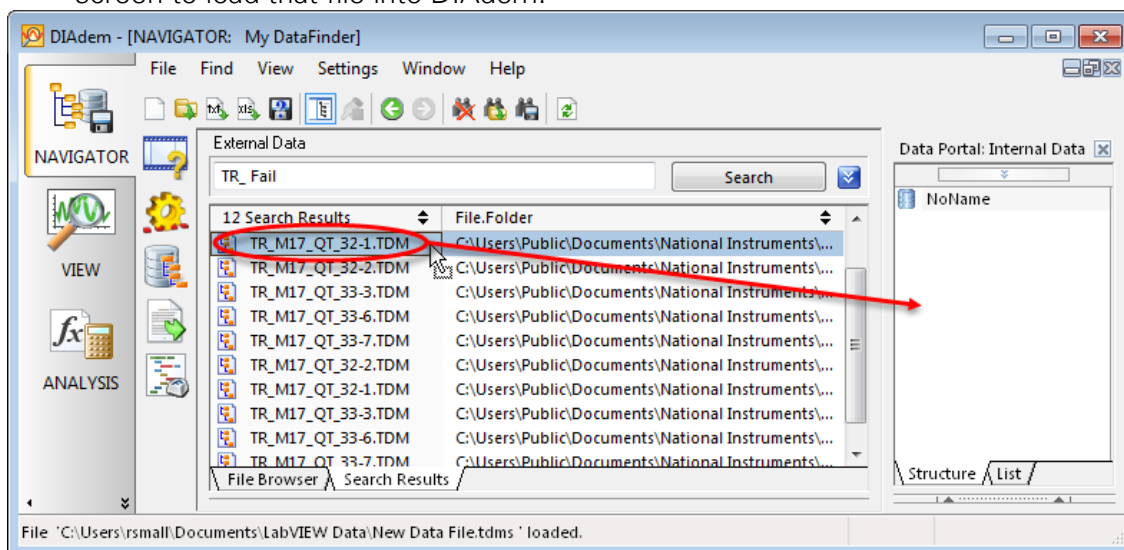


- 1.4 Another thing you know about the data files you need to analyze is that they all failed the temperature threshold test. **Add** the “Fail” keyword to the simple **search text** so that you now have “TR_ fail” in the search text field (make sure there is a space between the search terms). **Hit Enter** again or click on the “Search” button to execute the new search. Now you find a much smaller number of files which contain both “TR_” and “fail” properties.



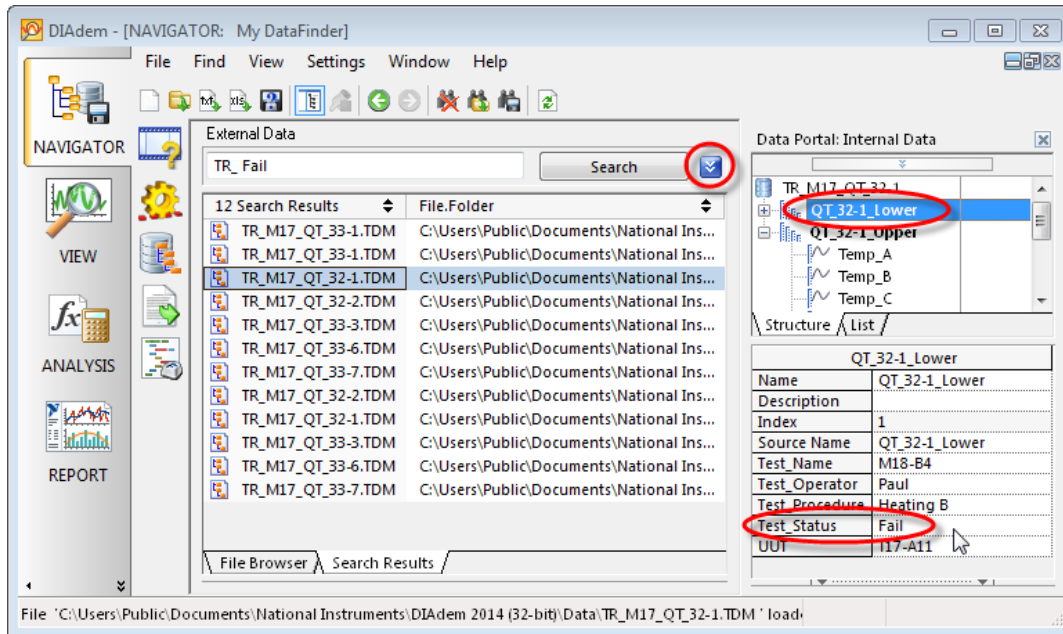
NOTE: DataFinder queries are NOT case-sensitive

- 1.5 Thus far the searching you’ve done in DIAdem has been very similar to other desktop search software from Google, Microsoft, etc. One huge difference with DIAdem is that the story doesn’t end with the search results list. **Click** on the **TR_M17_QT32-1.TDM** data file in the search results to highlight it, then **drag** that data file **into** the **DataPortal** on the right of your screen to load that file into DIAdem.

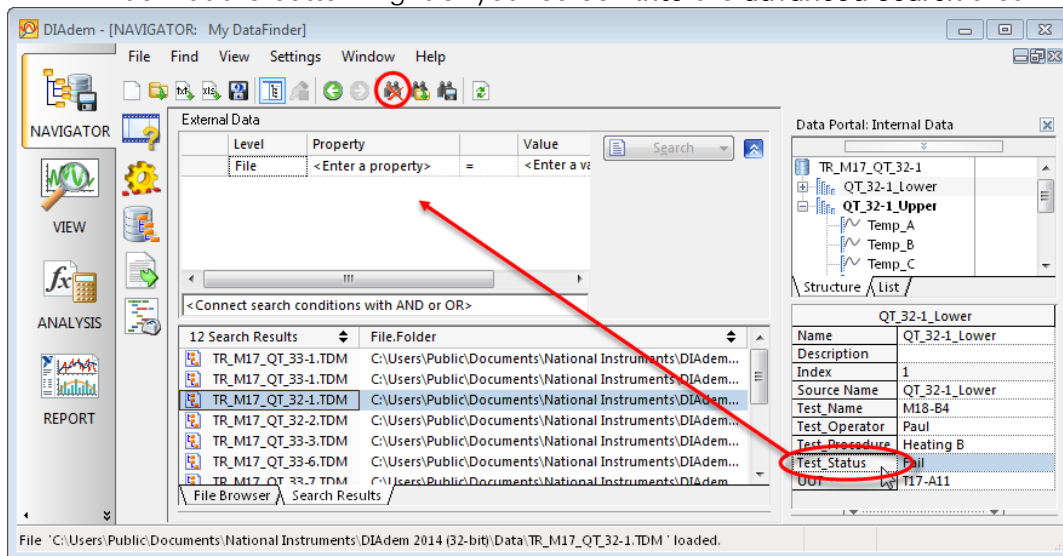


NOTE: You must drag the data file from the “Search Results” column

- 1.6 Now the entire contents of that data file are loading into DIAdem. You can see that this file has 2 groups of 10 channels each. Click on the "...Lower" group in the Data Portal so that you see group properties in the Data Portal property window at the lower right of your screen. In particular, you can now see that the property with the value "Fail" in it is the group property "Test_Status". Now click on the square, blue search toggle button to switch from the simple search to the advanced search.

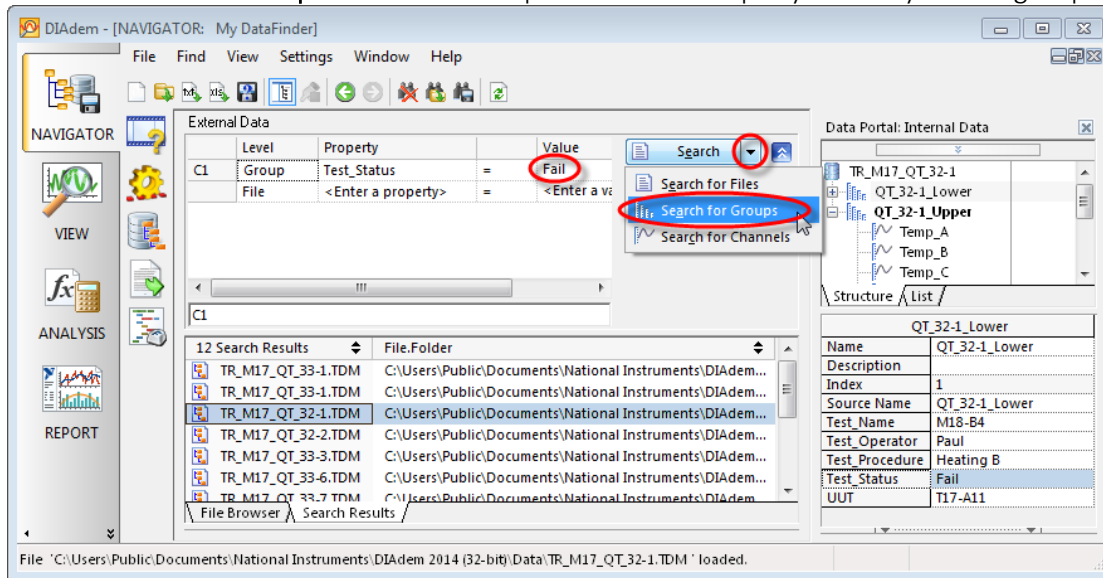


- 1.7 The advanced search in DIAdem enables you to construct a series of exact conditions, each based on a specific property, operator, and comparison value. Click on the "Delete Query" icon at the top of your screen to start with an empty query (click on the "Yes" button if asked to confirm the query deletion). Now drag the "Test_Status" property from the Data Portal property window at the bottom right of your screen into the advanced search area.



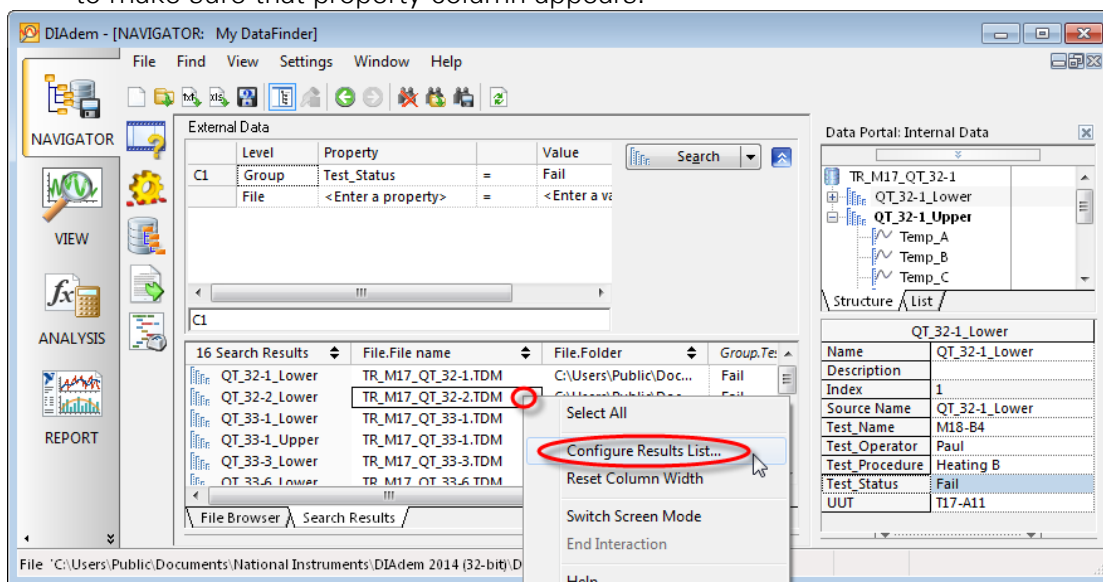
NOTE: You must drag from the property name (in this case "Test_Status")

- 1.8 If you do not see the text “Fail” in the automatically inserted query condition, as pictured below, click on that field and type in “Fail” so that you do (You could have loaded a test file with one group that failed and a second group that passed). So far you have always returned a list of files that matched your query conditions, but DIAdem can also query the structure inside the files. Click on the far right of the “Search” button so that you see the below drop list, then select “Search for Groups” from that drop list. Now the query will only return groups that failed.

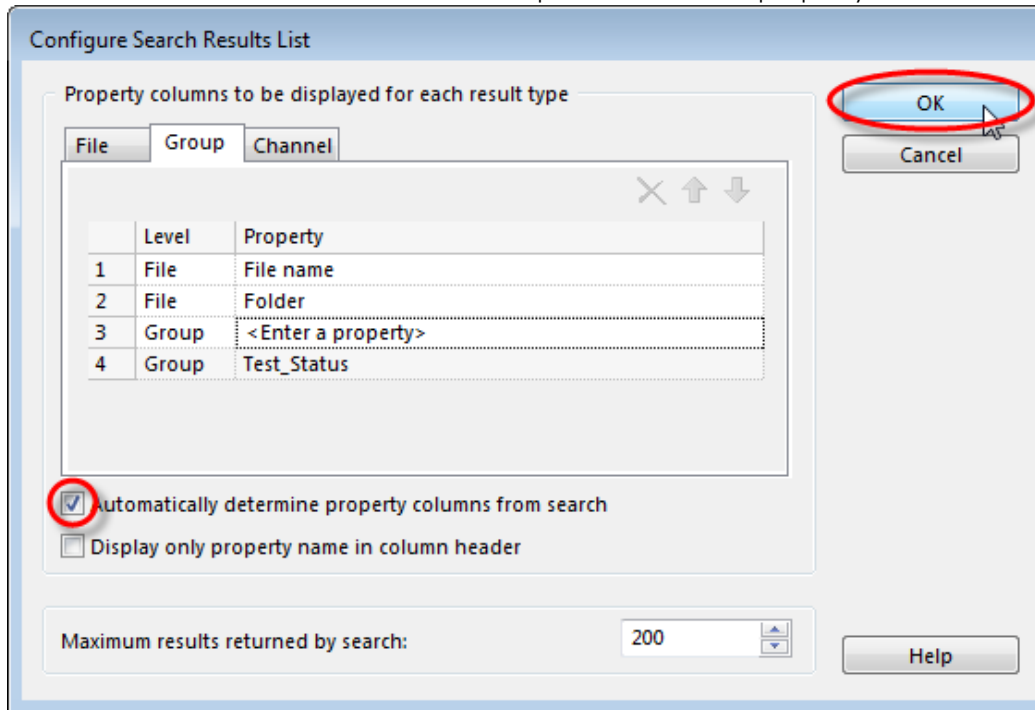


NOTE: DIAdem always inserts an empty “File” condition at the bottom of your query.

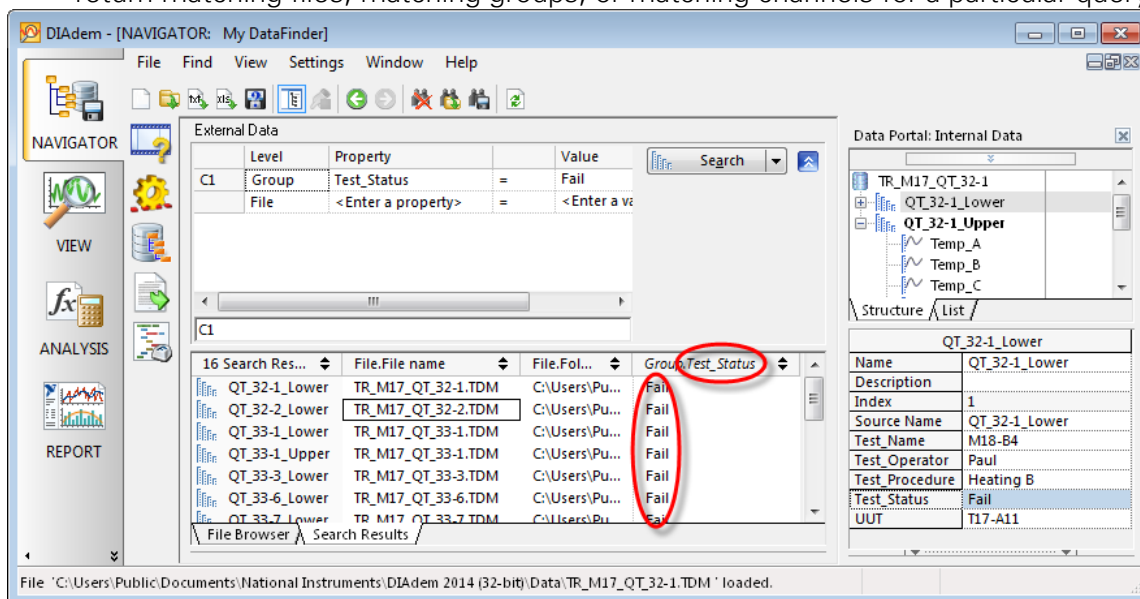
- 1.9 Your search has returned a list of all failed groups from various files located across any number of directories. You can configure which property columns appear in the Search Results list—in the below screenshot only “File.File name” and “File.Folder” appear, and you’d really like to see the “Group.Test_Result” property column to verify your query returned the correct results. Right-click on any of the cells in the Search Results, then select the “Configure Results List...” menu to make sure that property column appears.



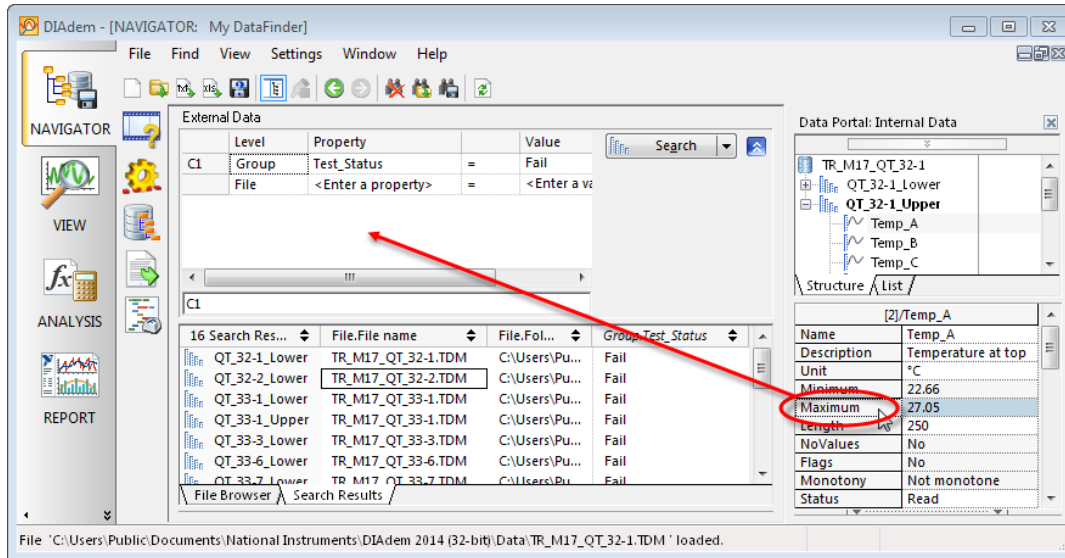
- 1.10 Here you see a list of all the property columns you have configured to appear in the Search Results list. Check the “Automatically determine property columns from search” checkbox at the lower left of this dialog, if it is not already checked. This causes the “Group.Test_Status” and any further properties used in queries to automatically appear as property columns in the Results List. Click the “OK” button to accept the automatic property column setting.



- 1.11 Now you can verify that all the groups returned by your query did indeed fail by looking at the “Group.Test_Status” property column. Some of the data files have 2 groups which failed, while other data files have only 1 group that failed. The advanced search in DIAdem enables you to return matching files, matching groups, or matching channels for a particular query

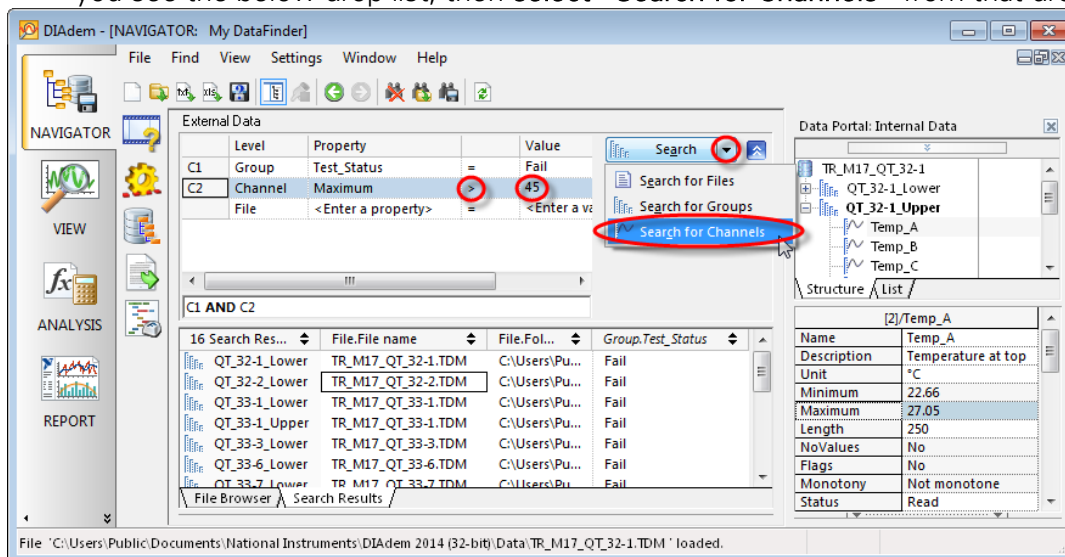


- 1.12 You actually only want to look at the data channels inside these groups which exceeded the thermal threshold value of 45°C. Click on the “Temp_A” channel in the second group in the Data Portal to the right of your screen, then find the “Maximum” property in the property window below it. Drag the “Maximum” property into the advanced search area to automatically add a new channel maximum condition.

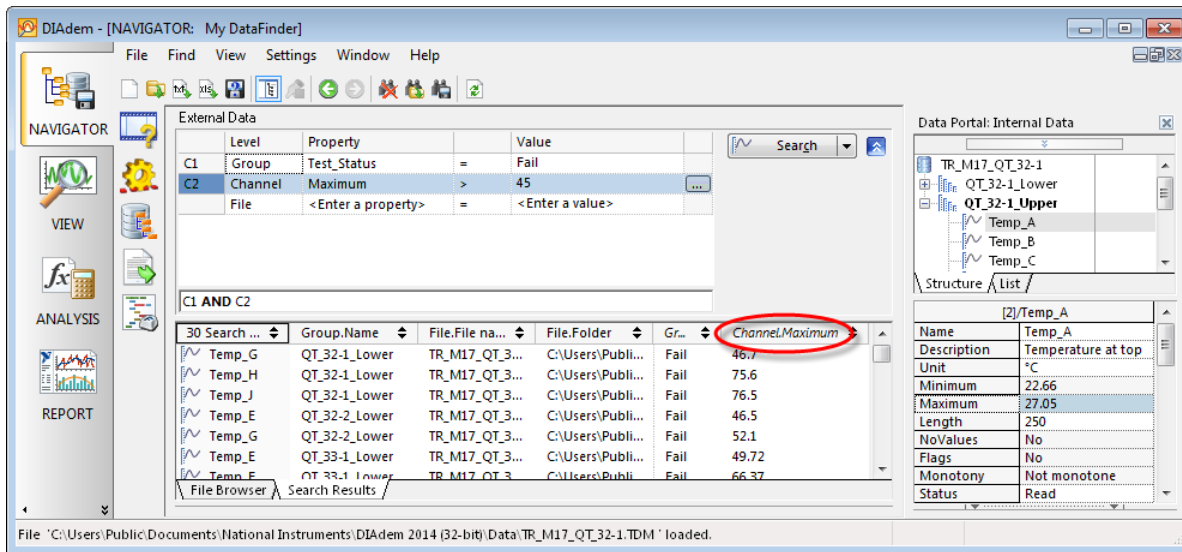


NOTE: You must drag from the property name (in this case “Maximum”)

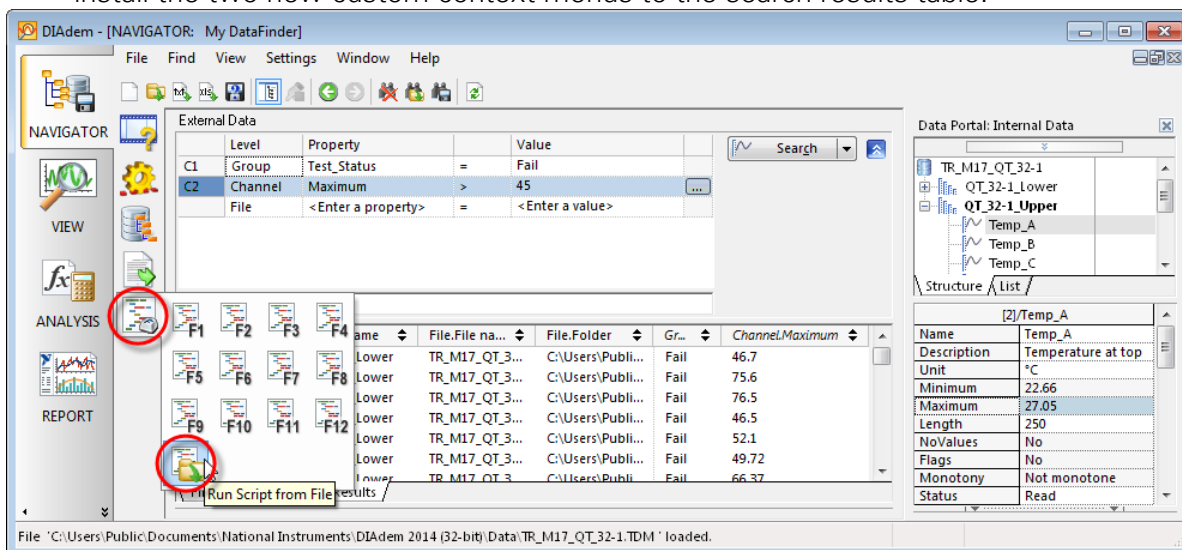
- 1.13 Change the operator in this new channel condition to be “>” and the comparison value to be 45 (double-click on the 45 to change it). Now you want the query to return only the channels in those failed groups which exceeded 45°C. Click on the far right of the “Search” button so that you see the below drop list, then select “Search for Channels” from that drop list.



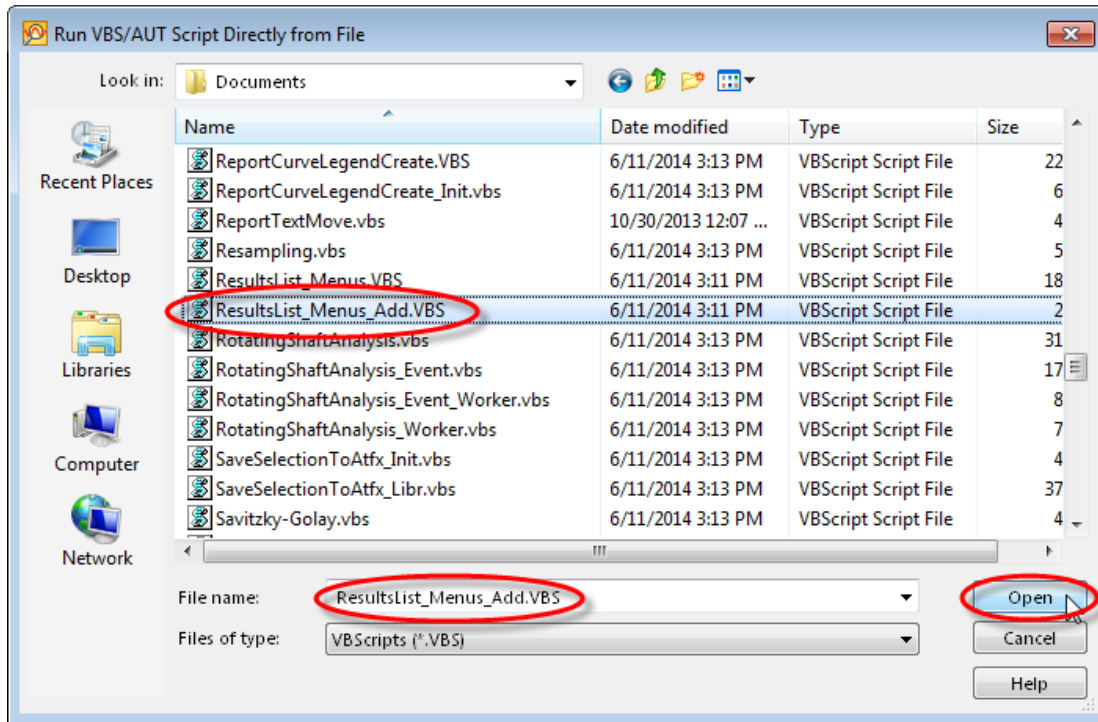
- 1.14 This query returns only the out-of-range channels inside failed groups. Notice that now each time you add a new condition like “Test_Status” or “Maximum”, a corresponding property column automatically appears in the search results list.



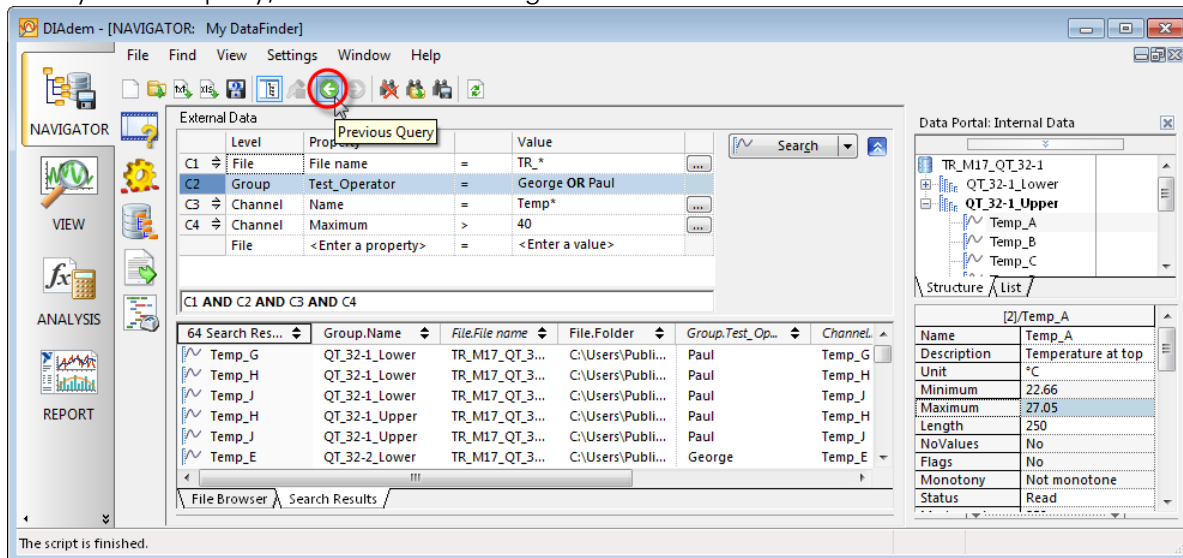
1.15 You can't really get a good idea of the distribution of these channel maxima by looking at their values in this search results table. What you need to do is to turn the "Maximum" column into a histogram graph. A colleague has just sent you a VBScript she says will install two very useful custom menus into the context menu of your search results table, and one of them is a histogram menu. Click on the small "DIAdem Scripts..." icon (not the big tab SCRIPT icon), then select the "Run Script from File" icon at the bottom in order to run your colleague's VBScript and install the two new custom context menus to the search results table.



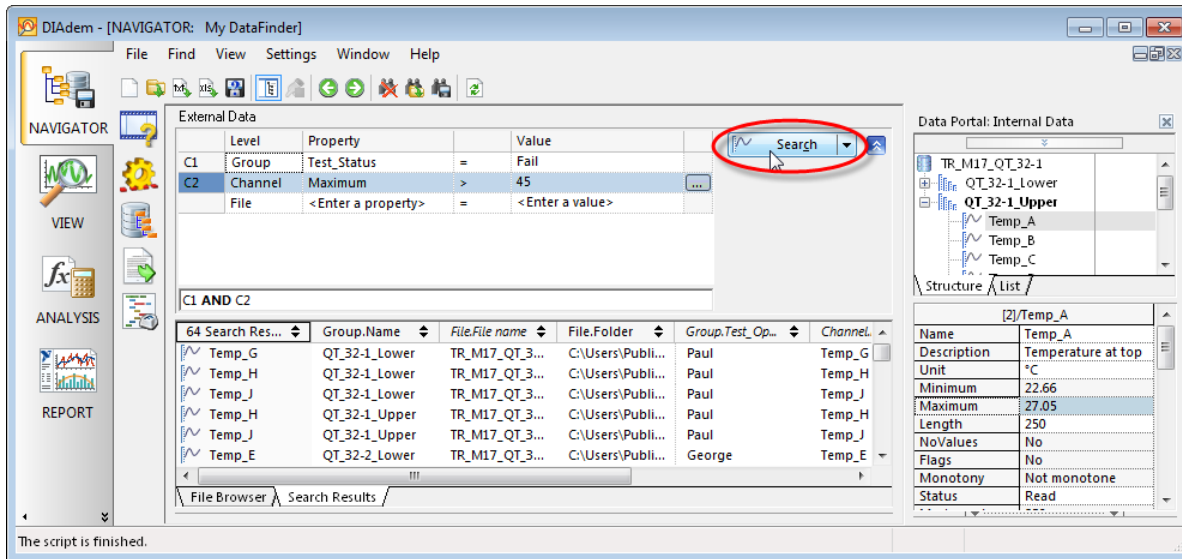
1.16 Navigate to the "...Program Files\National Instruments\DIAdem 2014\Examples\Documents\" directory and select your colleague's "ResultsList_Menus_Add.VBS" (Note the "_Add" suffix) script file. If you don't see this VBScript file, double-check that the "Documents" directory is in fact under "Program Files". Finally, click on the "Open" button to run the VBScript that adds her two custom menus.
(On 64 bit operating systems you must use the "Program Files (x86)" folder)



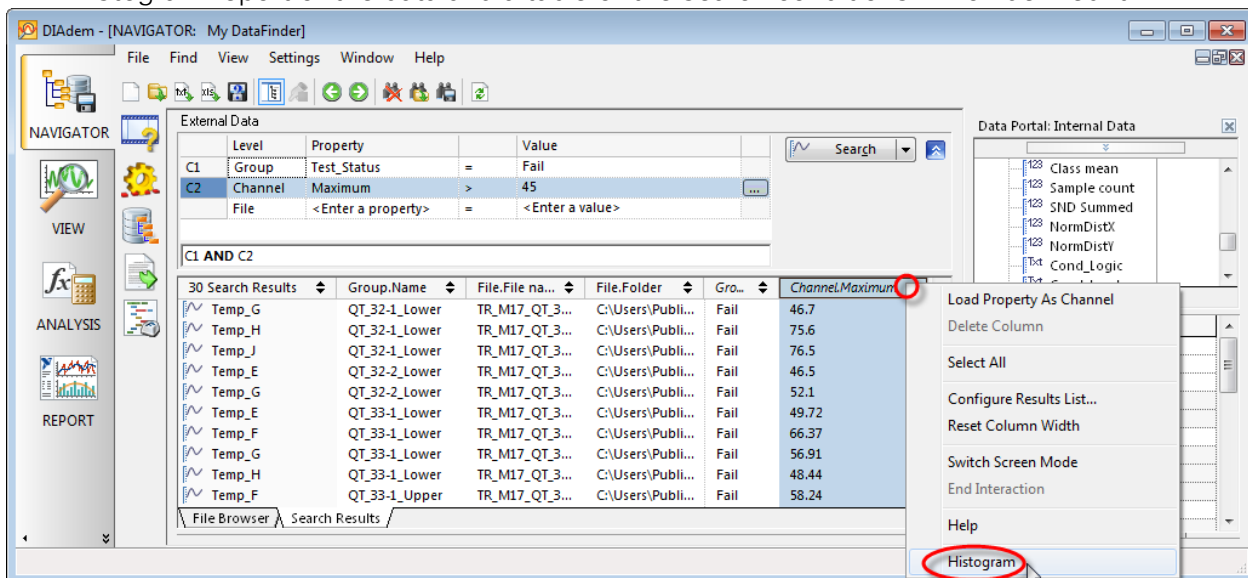
1.17 Whoops! It looks like that VBScript not only installed the custom context menus, it also loaded up your colleague's favorite query. Don't worry, though, DIAdem stores every query that you've run— **click** on the white and green **"back arrow"** at the top of your screen in order to retrieve your last query, the one YOU configured.



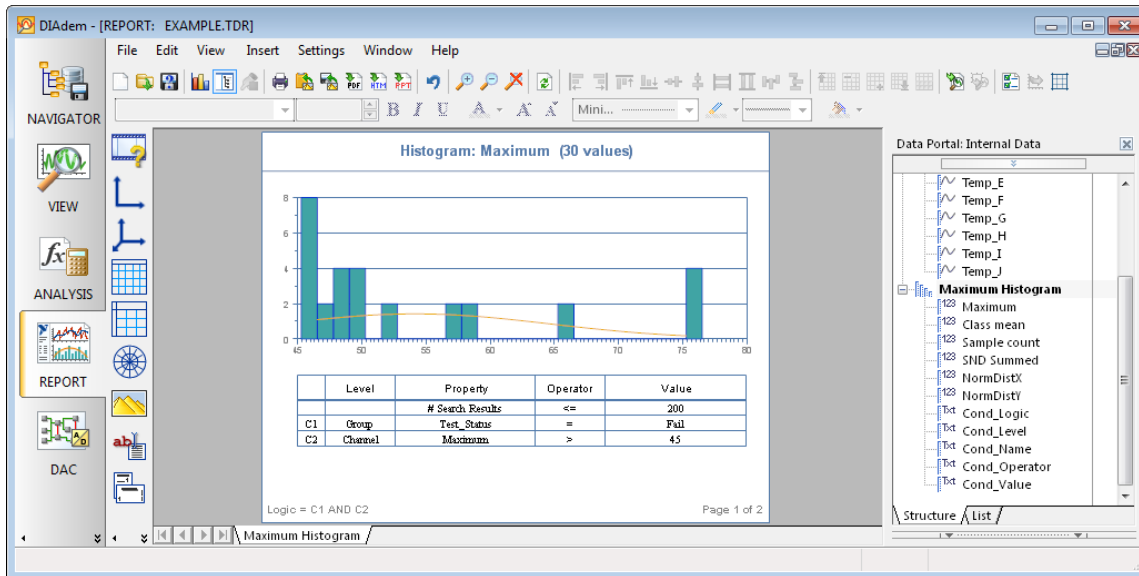
1.18 Now you have recovered the query you configured. **Click** on the **"Search"** button to re-run this query.



1.19 Now **right-click** on the “**Channel.Maximum**” property column heading and **select** the custom “**Histogram**” menu that your colleague’s script just inserted. The DIAdem environment can be adapted and customized in many ways to make your everyday activities much more streamlined and convenient. This “Histogram” menu automatically loads the “Maximum” column values as a new channel in the Data Portal, calculates the histogram of this channel, and configures a histogram report of the data and a table of the search conditions which defined it.

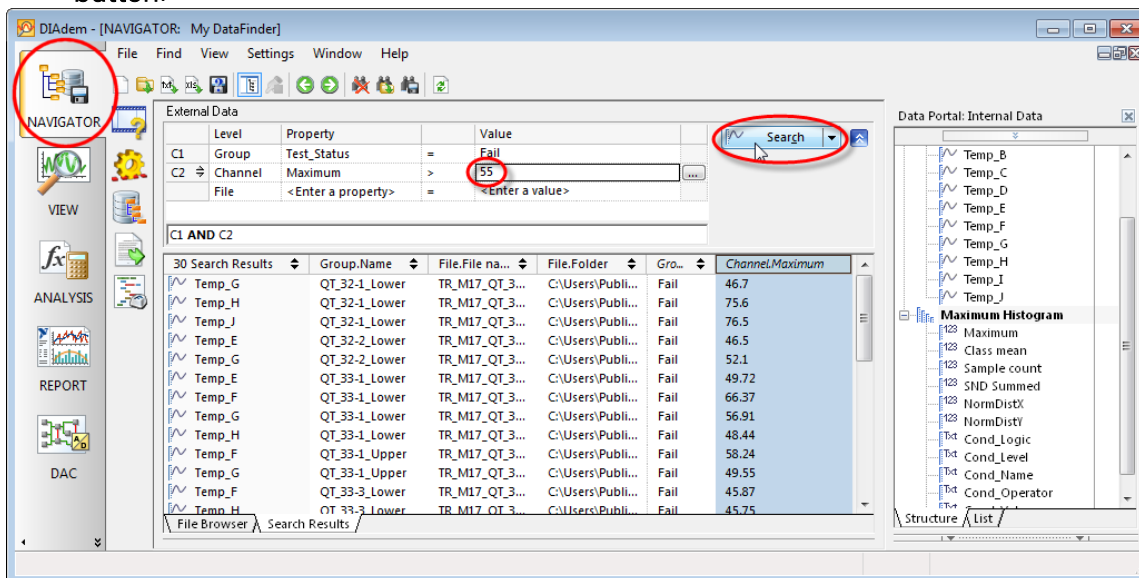


1.20 Now you can see that the bulk of the exceptions lie in the 45°C - 55°C range, with a few particularly hot sensors exceeding 55°C. You begin to suspect that there are a few hot spots on the furnace which are pulling the whole thermal profile out of specification. You decide to take a closer look at the channels which exceed 55°C.

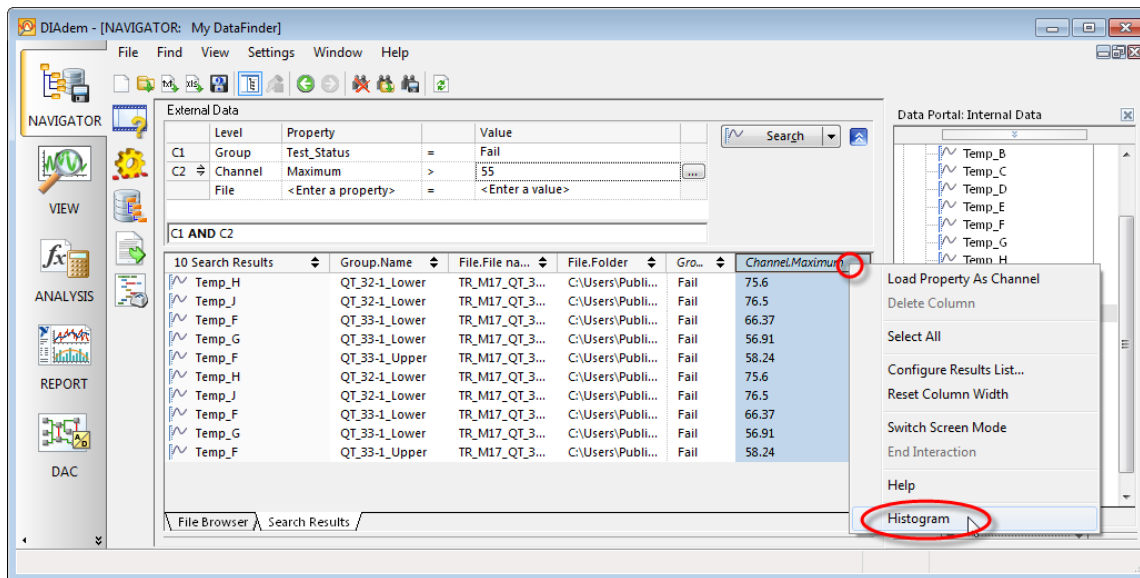


NOTE: Your queried data will look slightly different than the graph above

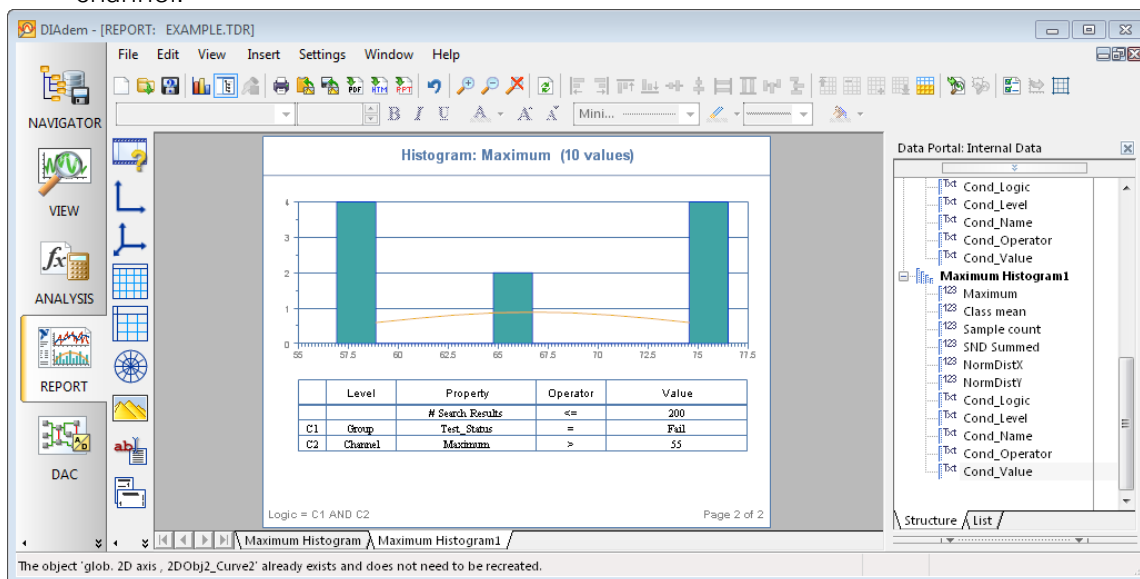
1.21 Click on the “NAVIGATOR” tab at the top left of your screen to switch back to the advanced search, then **change** the channel maximum **comparison value** to **55** and click on the “Search” button.



1.22 Now you see that there are only a few of these suspected hot spots among the original out-of-range channels. **Right-click** on the “Channel.Maximum” column heading and **select** the “Histogram” menu again to automatically create a histogram report of these hot spot channels.

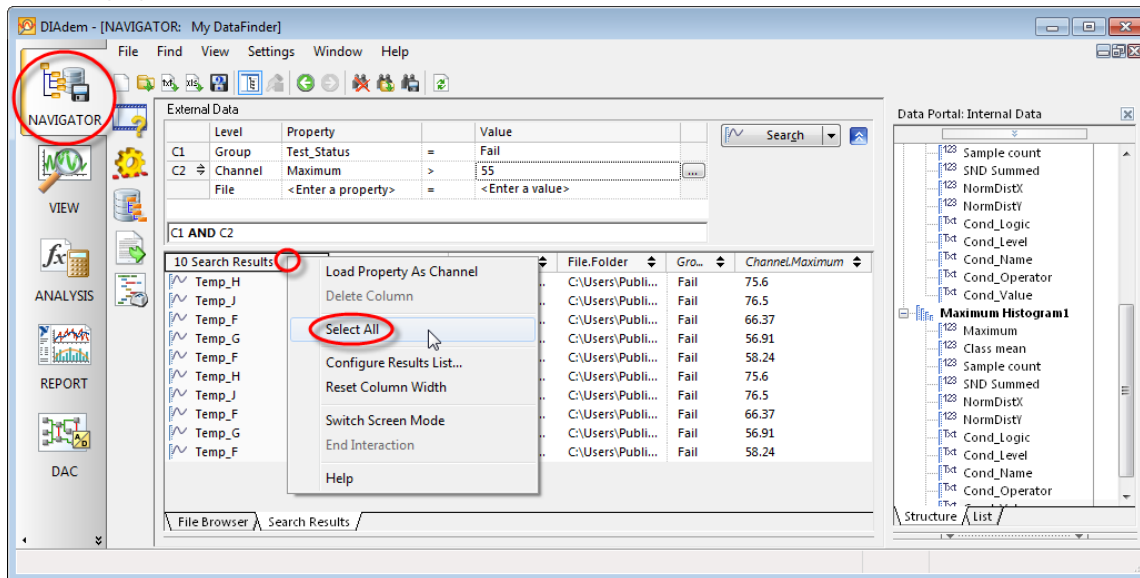


1.23 You see that you have indeed isolated the hottest channels. Note that each time you run the "Histogram" menu, the property column you selected is loaded into a new channel in a new group in the Data Portal, and the histogram and normal distribution are calculated from the loaded channel.

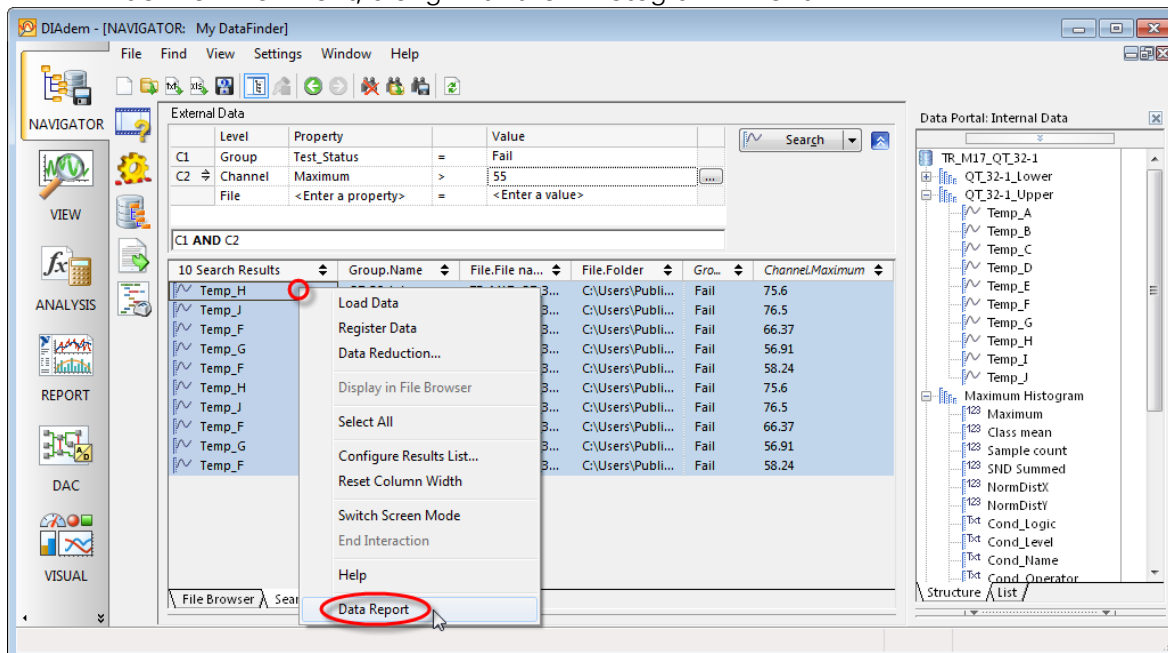


NOTE: Your queried data will look slightly different than the graph above

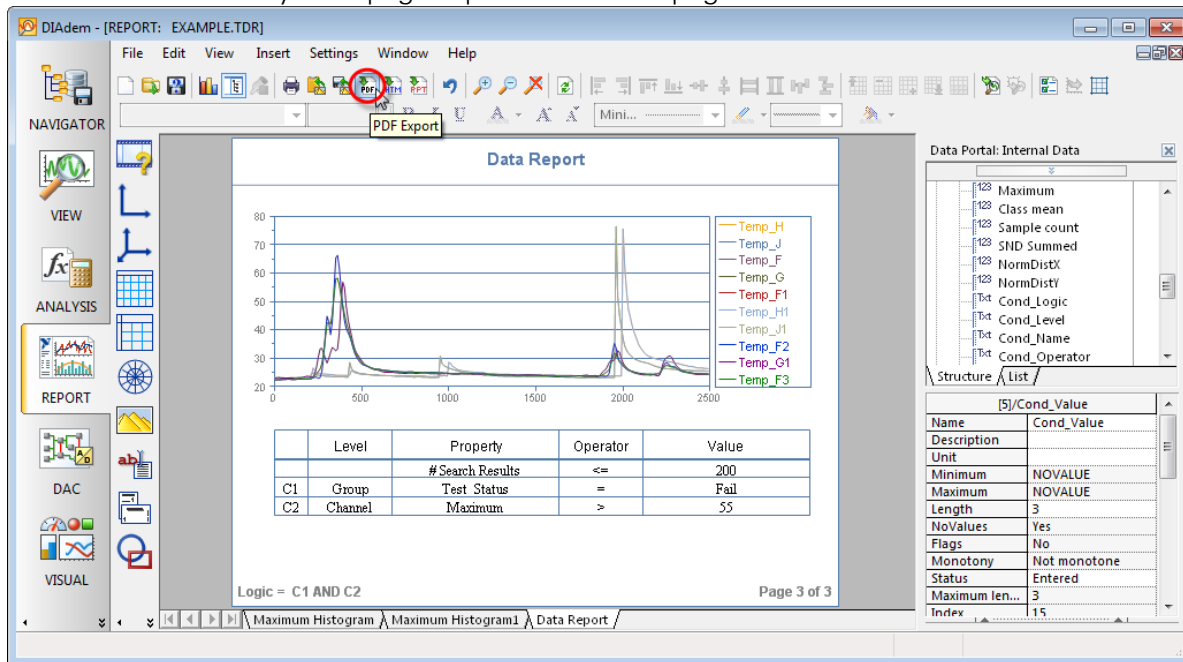
1.24 Click on the “NAVIGATOR” tab at the top left of your screen to switch back to the advanced search. You want to plot all of these out of range data channels, but first you need to highlight them all. **Right-click** on the “Search Results” column header, then **choose** the “Select All” menu.



1.25 Now **right-click** on a **cell** in the first “Search Results” column and **select** the “Data Report” menu. The first “Search Results” column represents the array of data in each channel. The “Data Report” menu is the second custom menu that your colleague’s script added to the DIADEM environment, along with the “Histogram” menu.

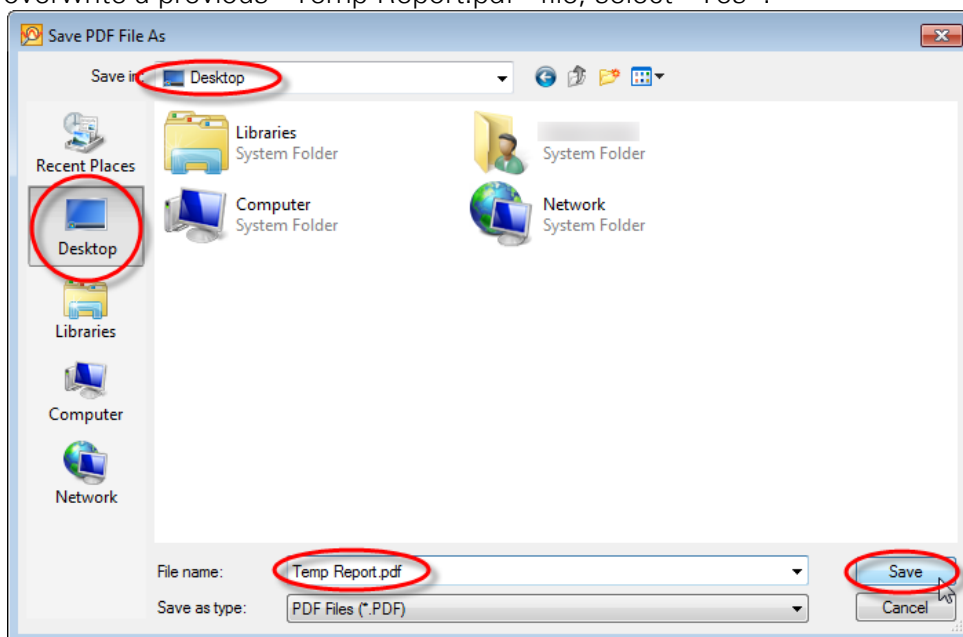


- 1.26 This custom “Data Report” menu automatically loads and plots the selected channels on a standard report. Now you have your initial results, and you need to email these back to your boss, who doesn’t have DIAdem installed. **Click** on the “**PDF Export**” icon at the top of your screen to send your 3 page report to a new 3 page PDF file.

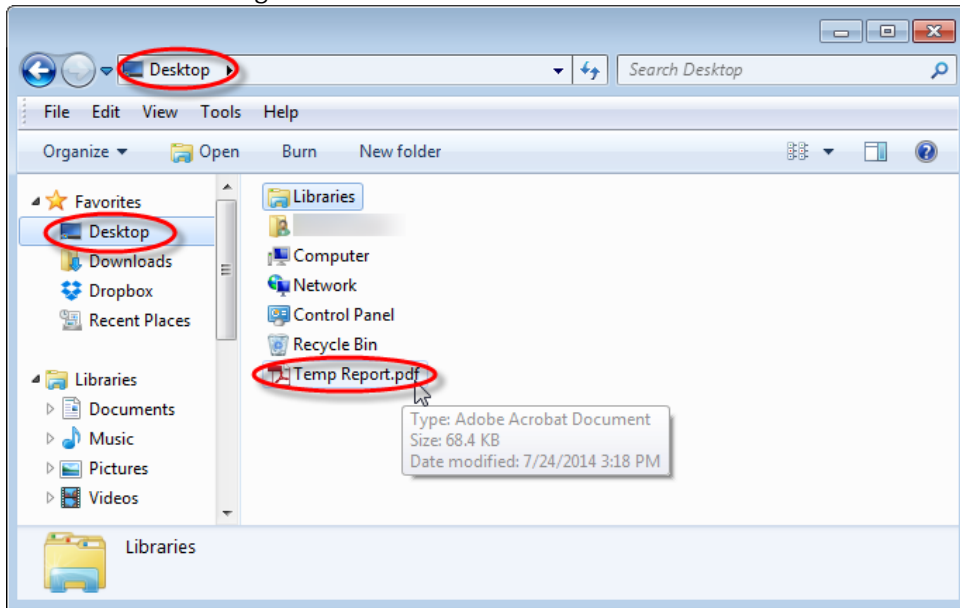


NOTE: Your queried data will look slightly different than the graph above

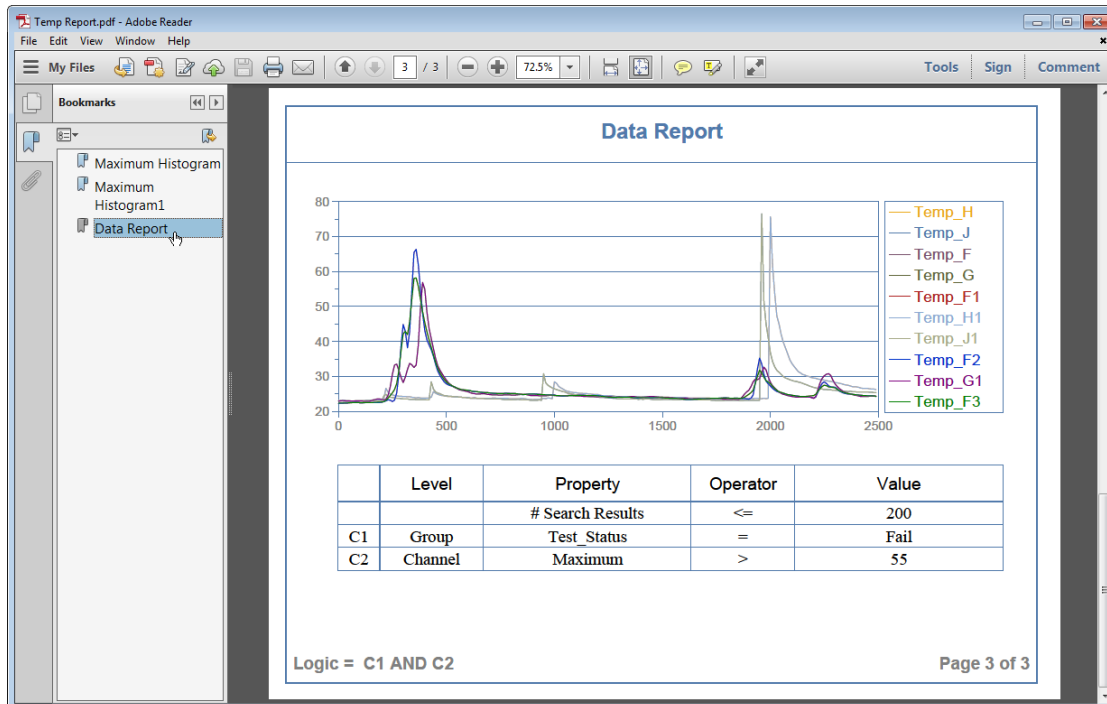
- 1.27 In the “Save PDF File As” dialog, **Navigate** to the **Desktop**, name the new file “**Temp Report.pdf**”, then **click** on the “**Save**” button to create the new PDF report. If asked whether to overwrite a previous “Temp Report.pdf” file, select “Yes”.



1.28 Open your Windows Explorer, navigate to the Desktop, then double-click on the newly created “Temp Report.pdf” file to open it up in a PDF file reader, in order to verify that the file is correct before sending it.



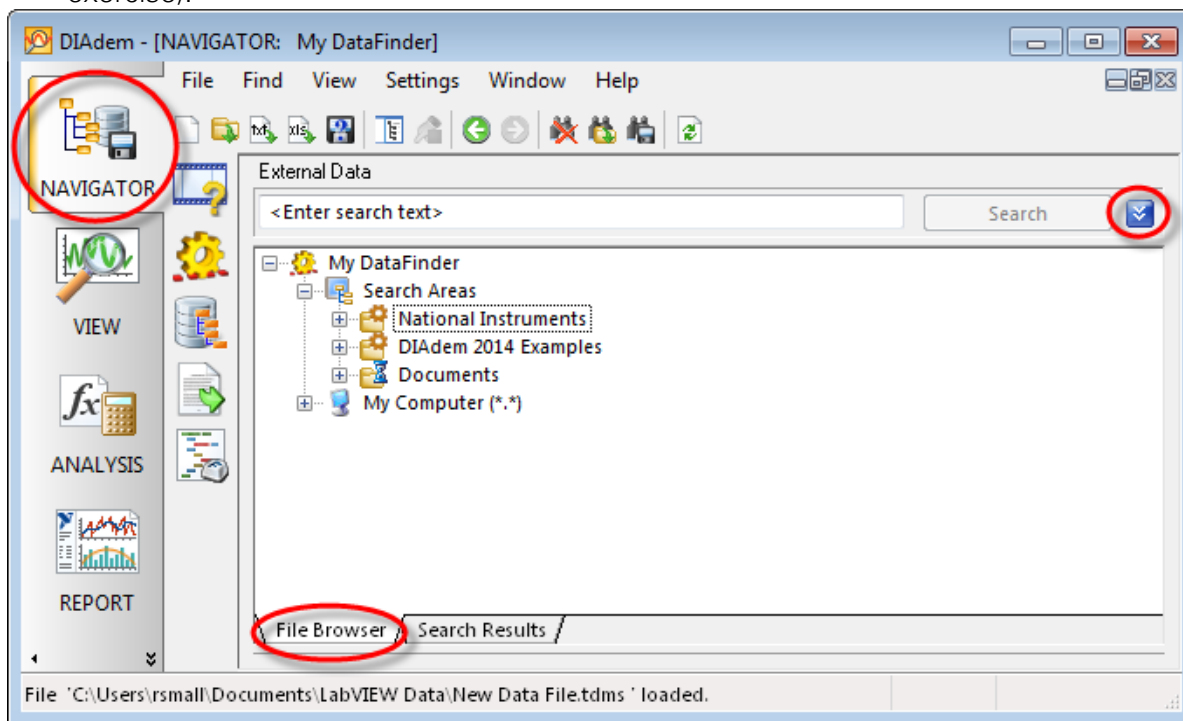
1.29 Here are the 3 report pages you just created in DIAdem, faithfully encoded in a manager-friendly PDF file. Notice the names of the furthest-out-of-range sensors pictured below (on the 3rd page of your report). You have “Temp_F”, “Temp_G”, “Temp_H” and “Temp_J”. Sensors A – E are on the left side of your furnace, and sensors F – K are on the right side of your furnace. It doesn’t look like only one sensor is to blame, but rather almost all the sensors on the right side of the furnace.



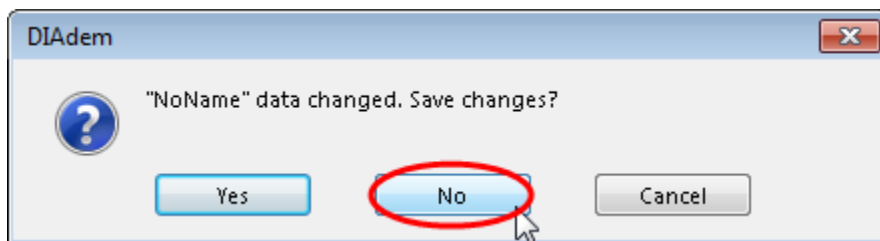
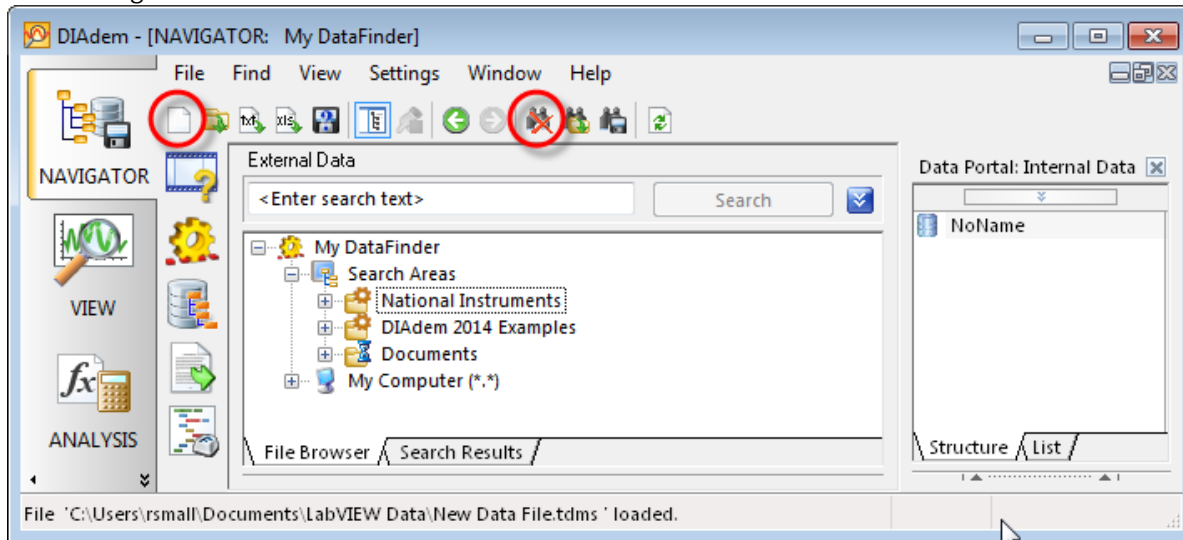
Exercise 2 - Create Automated Analysis and Reporting

Scenario: Your group is rolling out a new low frequency acoustic data test rig— you already have three data files with many more coming in soon, and you will be in charge of reporting all this data. You need to look at this early data, determine the best way to analyze and report it, then develop an automatic reporting process so that you can quickly create reports as more and more data come in. You will load the first data set in NAVIGATOR, take a quick look at the data in VIEW, apply a digital filter to the data in ANALYSIS, then create a custom display of the data in REPORT. Once you have gone through these steps interactively for the first data set, you will repeat them with the VBScript recorder running in SCRIPT for the second data set, in order to automatically generate your reporting script. You will then test the new reporting script with the third data set to verify that you are ready for the full roll-out.

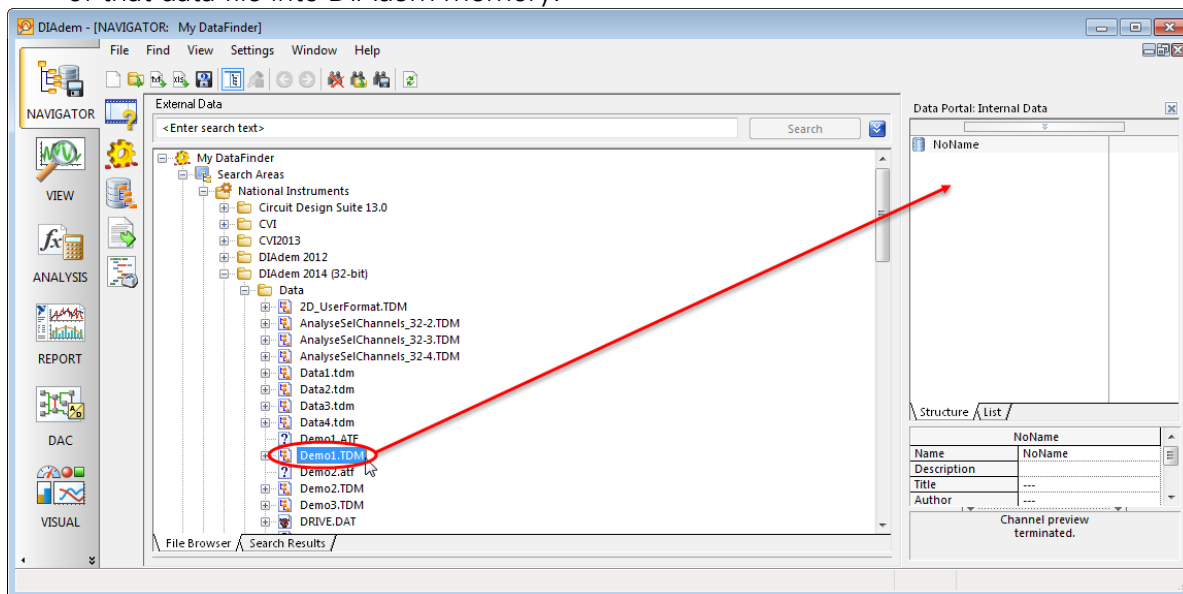
- 2.1 First get ready to load data into DIAdem. Make sure that the “NAVIGATOR” tab at the top left of your screen is selected. Next make sure the “File Browser” tab is selected at the bottom left of your screen. Finally, if you don’t see the **simple search bar** (pictured below with the text “<Enter text to find in search areas>”), then click on the toggle button at the top right of your screen to switch back to the simple search shown below, since it takes up less room (no searching in this exercise).



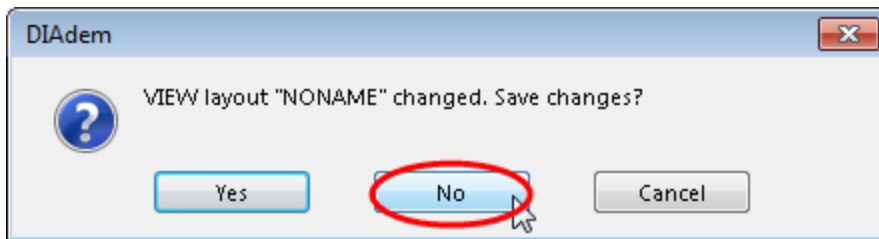
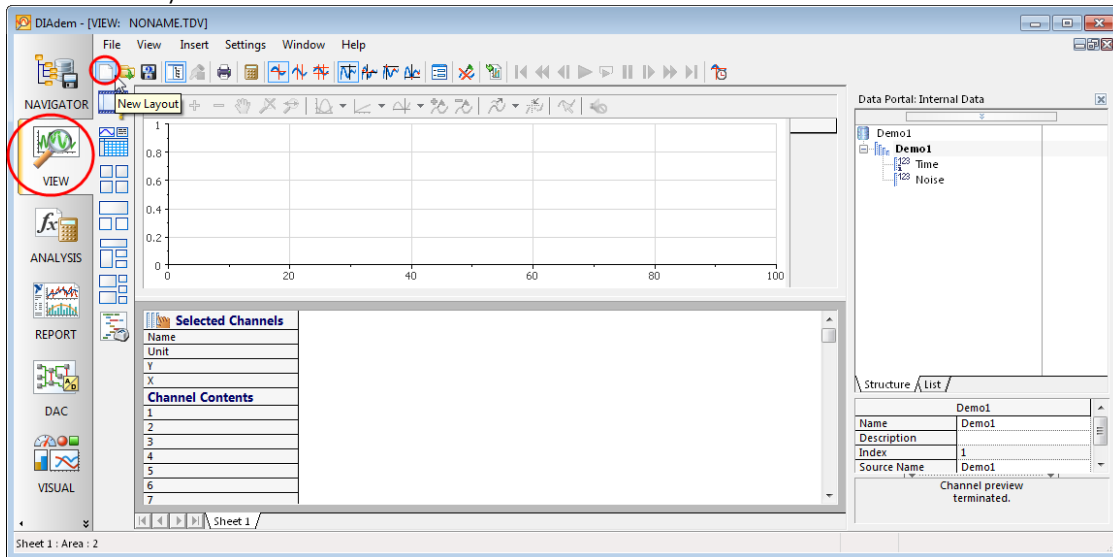
- 2.2 Click on the “Delete Internal Data” icon at the top left of your screen in order to clear out the Data Portal and start with a clean slate. Click the “No” button if you are asked if you want to save changes to the data in the Data Portal.



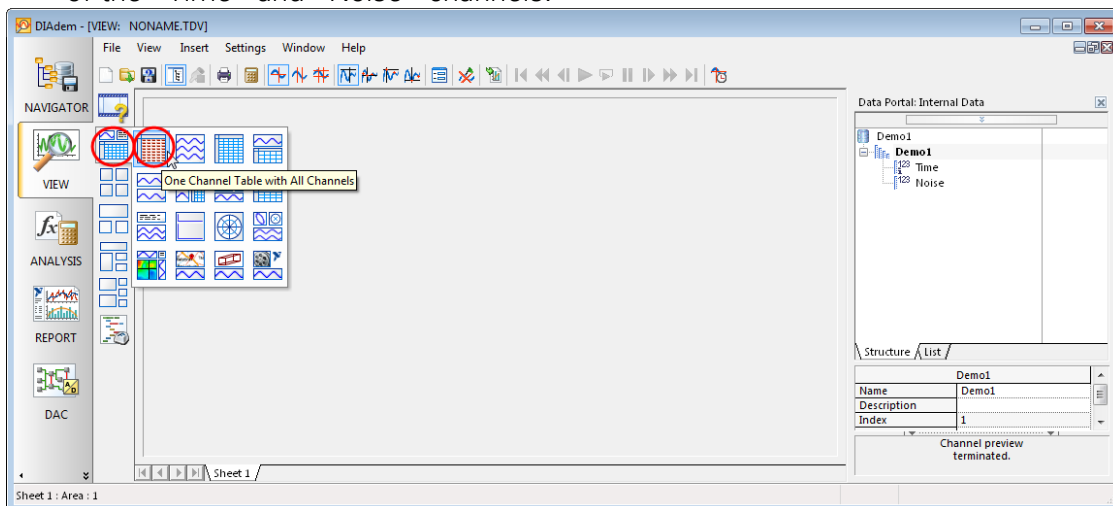
- 2.3 Open up the “National Instruments” folder under the “Search Areas” node and **navigate** down to the “DIAdem 2014\Data\” directory. **Drag** the file “Demo1.TDM” from the file browser on the left **into** the **Data Portal** on the right of your screen. This loads the data, properties, and hierarchy of that data file into DIAdem memory.



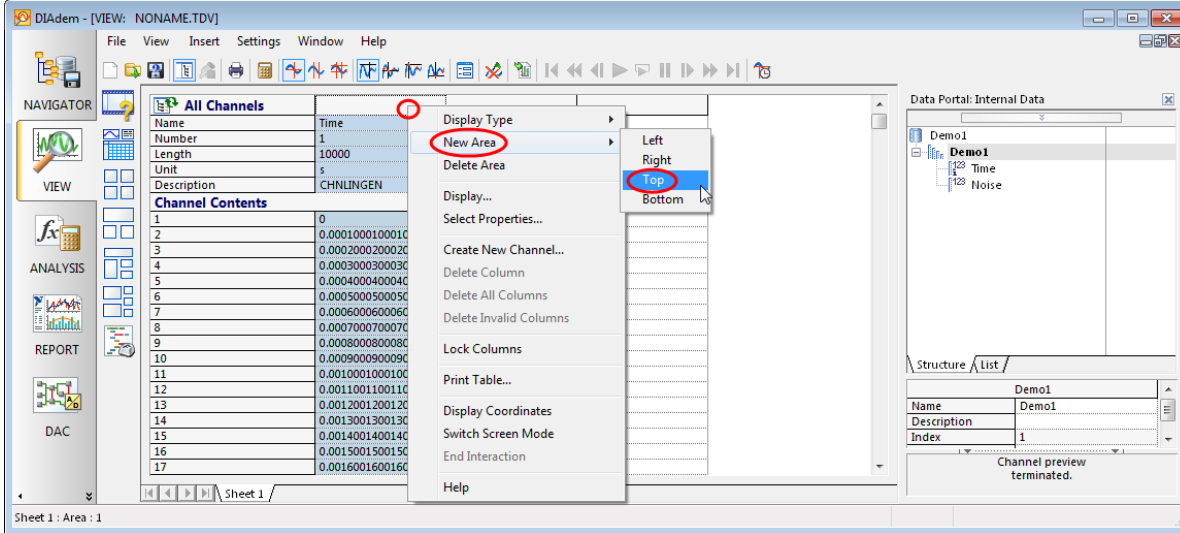
2.4 You see now that the “Demo1.TDM” file contains one group of 2 channels—a “Time” channel and a “Noise” channel. In order to get a quick graphical look at this data, first **change** to the **VIEW** panel by clicking on its icon at upper left corner of your screen. Then **click** on the “**New Layout**” icon at the top left of your screen in order to clear the VIEW panel and start from scratch. Click the “No” button if you are asked if you want to save changes to the VIEW layout you have currently.



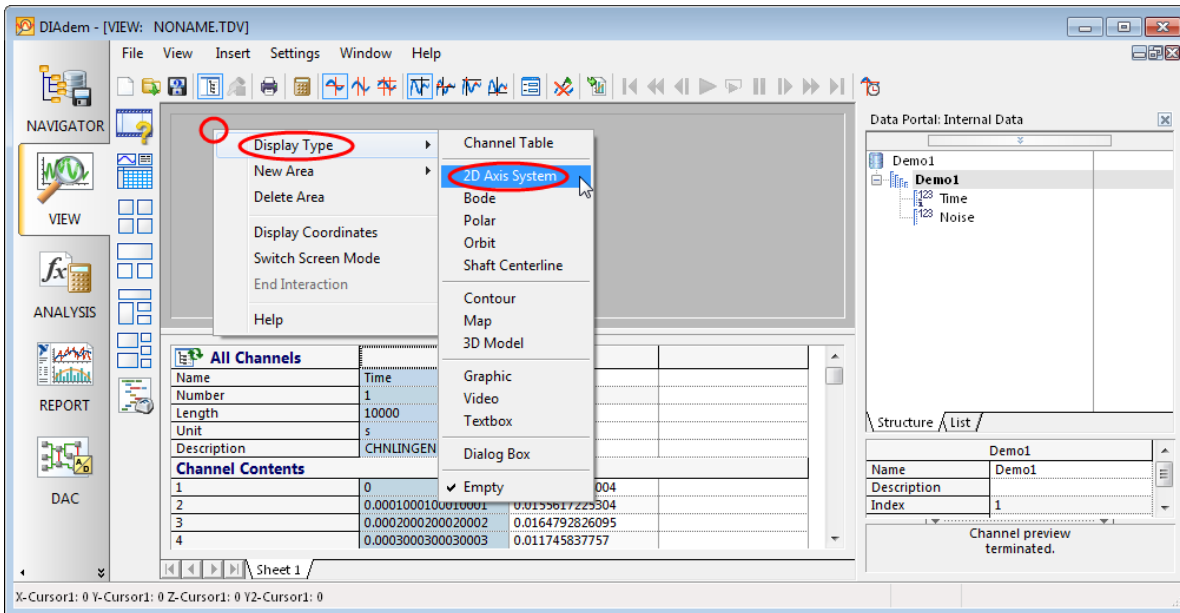
2.5 Click on the “Assigned Worksheet Partitions” icon at the top left of your screen and then **select** the “**One Channel Table with All Channels**” icon in order to create a table that displays the values of the “Time” and “Noise” channels.



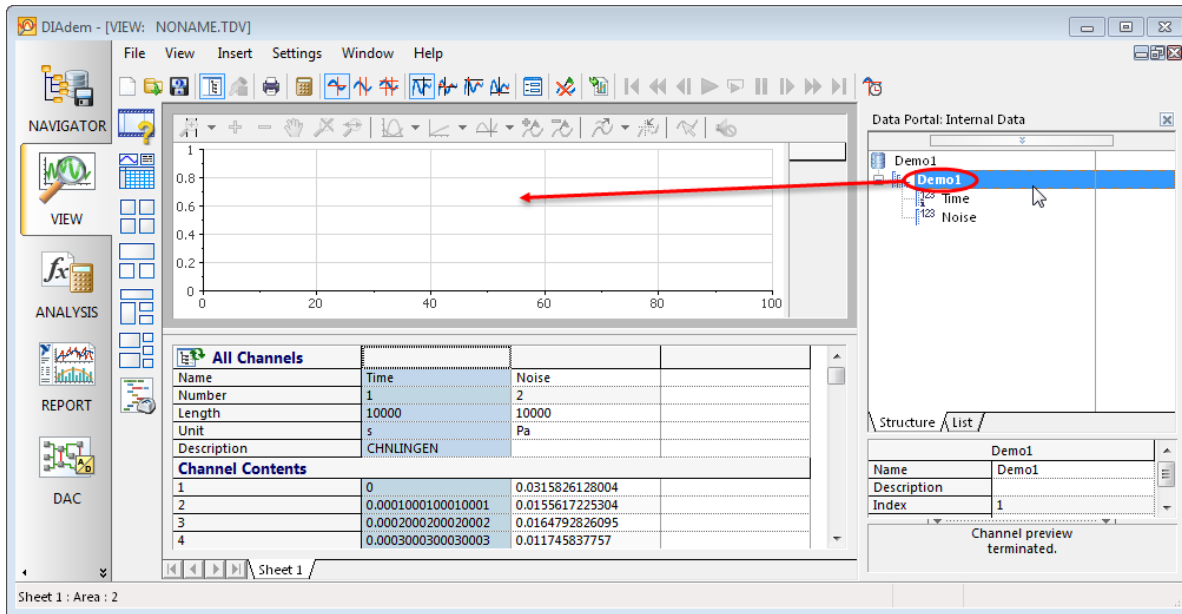
2.6 Right-click on the new **table** you just created and select the “New Area>>Top” menu in order to create a new VIEW area above the table you have.



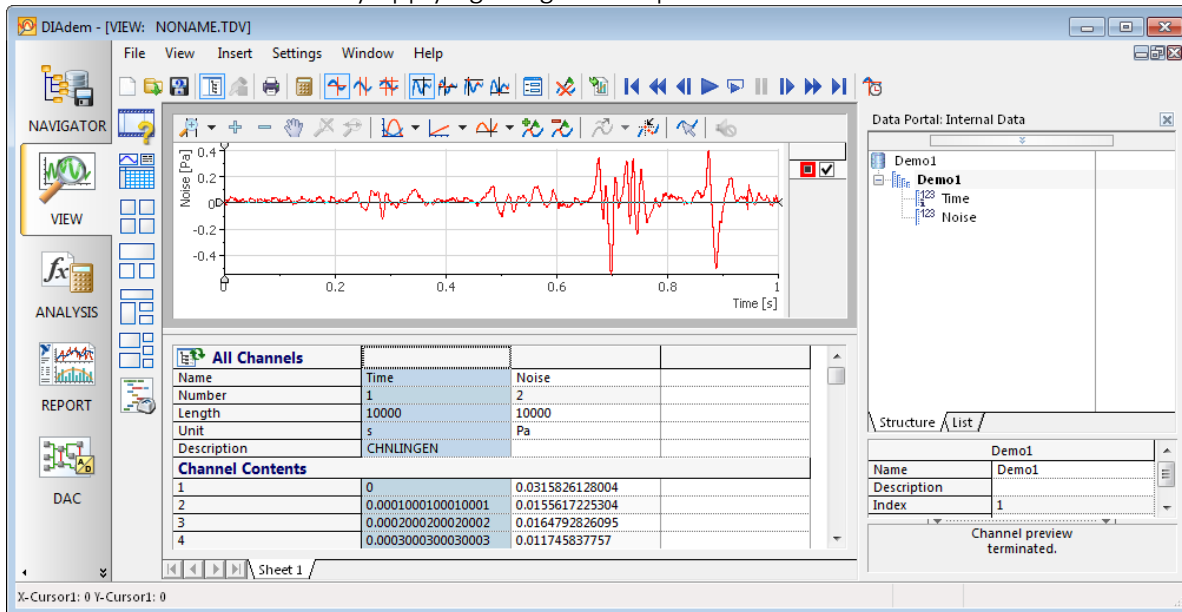
2.7 Right-click on this new **blank VIEW area** and select “Display Type>>2D Axis System” in order to define the top area to contain a 2D graph. In this way you can freely define the number, layout, and function of all VIEW areas.



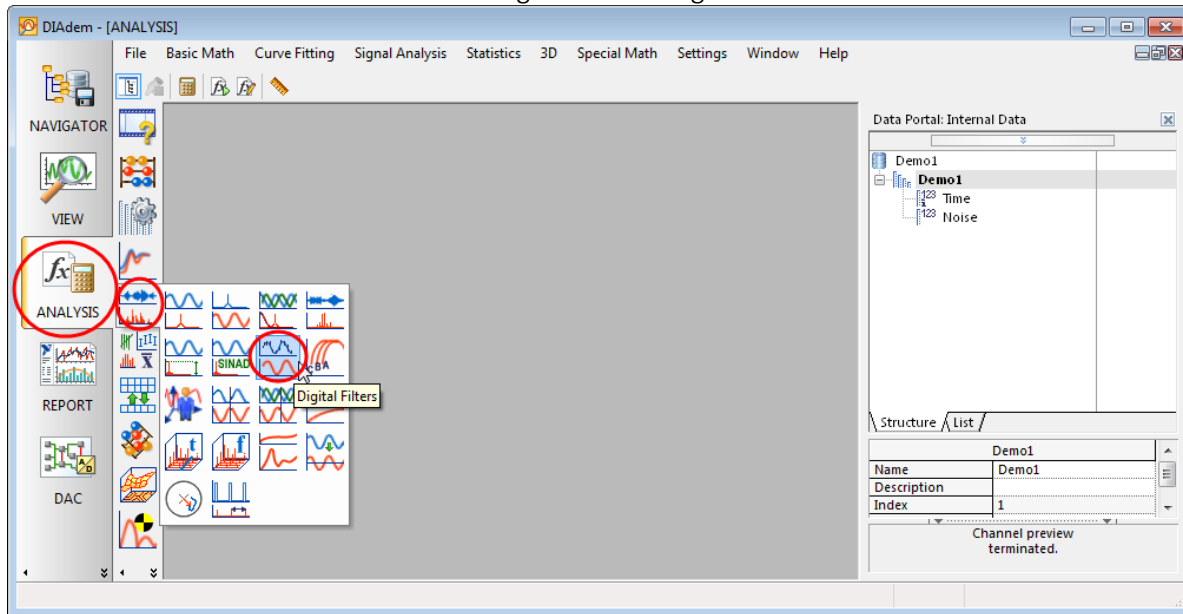
2.8 Select the “Demo1” group in the Data Portal at the right of your screen and **drag** it into the **top VIEW area**. Dragging the entire group will automatically graph the “Noise” channel on the Y-axis vs. the “Time” channel on the X-axis.



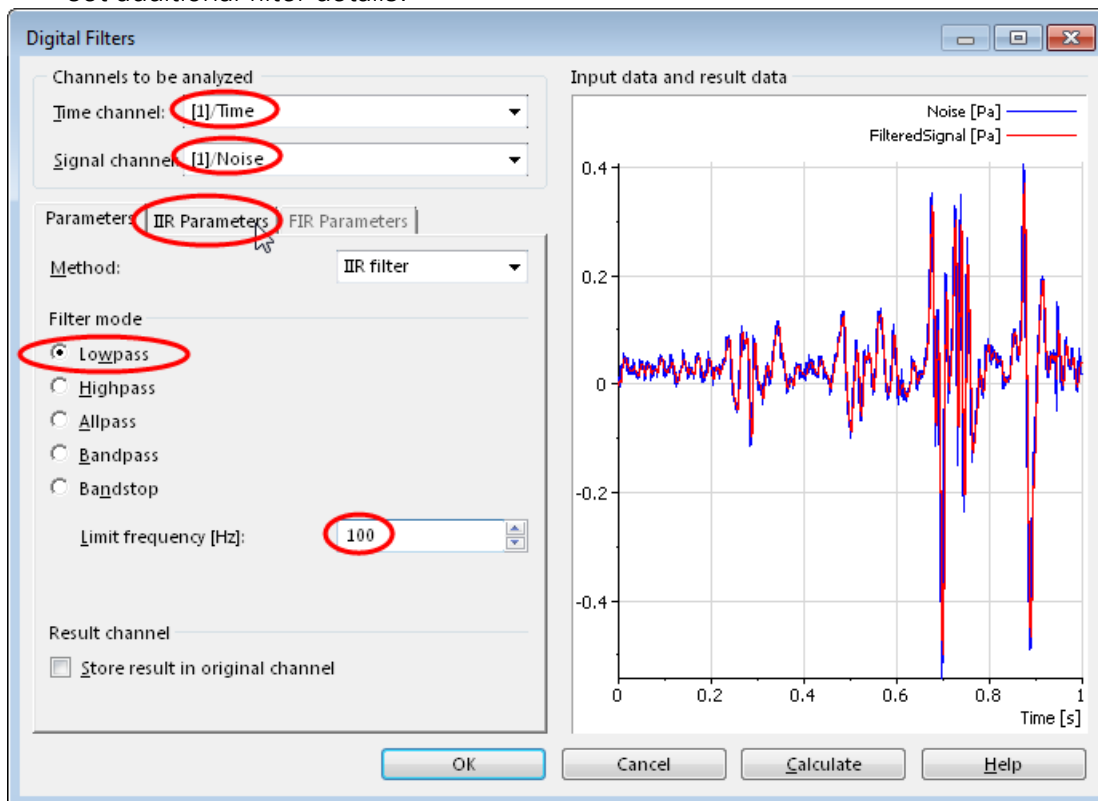
2.9 Now you see the acquired signal from your “Demo1.TDM” file in both graphical and tabular fashion. You suspect there is high frequency noise in this signal, so you decide to try to remove this unwanted noise by applying a digital low-pass filter.



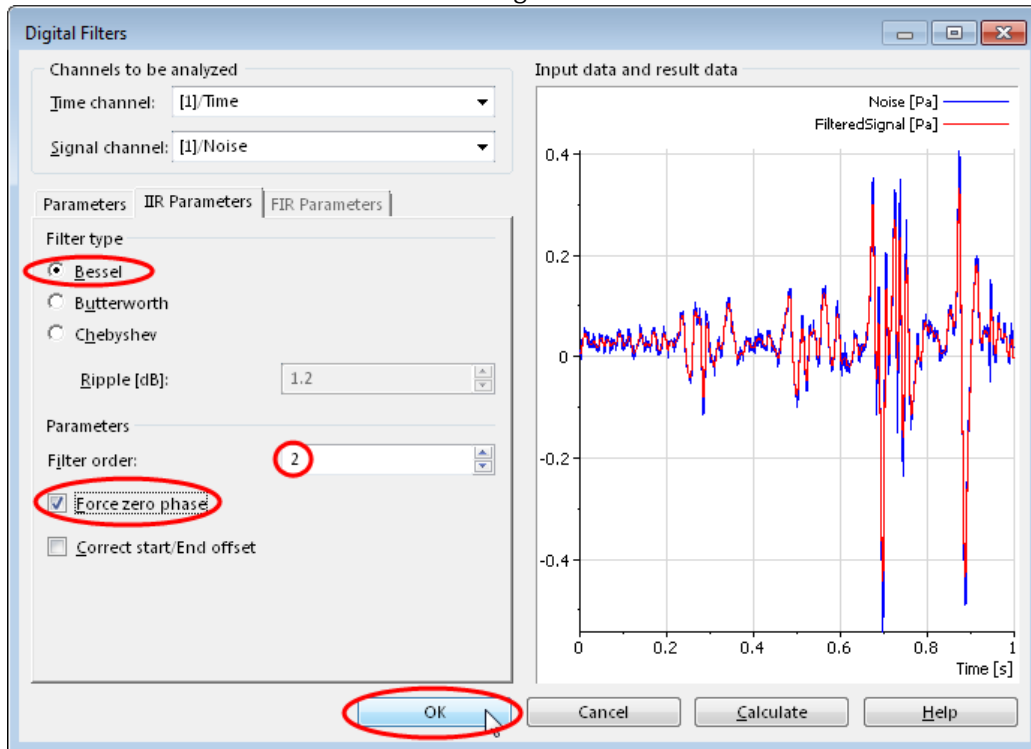
2.10 Click on the **ANALYSIS** tab icon at the left of your screen in order to switch to the ANALYSIS panel, then click on the “**Signal Analysis**” icon at the left of your screen and select the “**Digital Filters**” function to launch its configuration dialog.



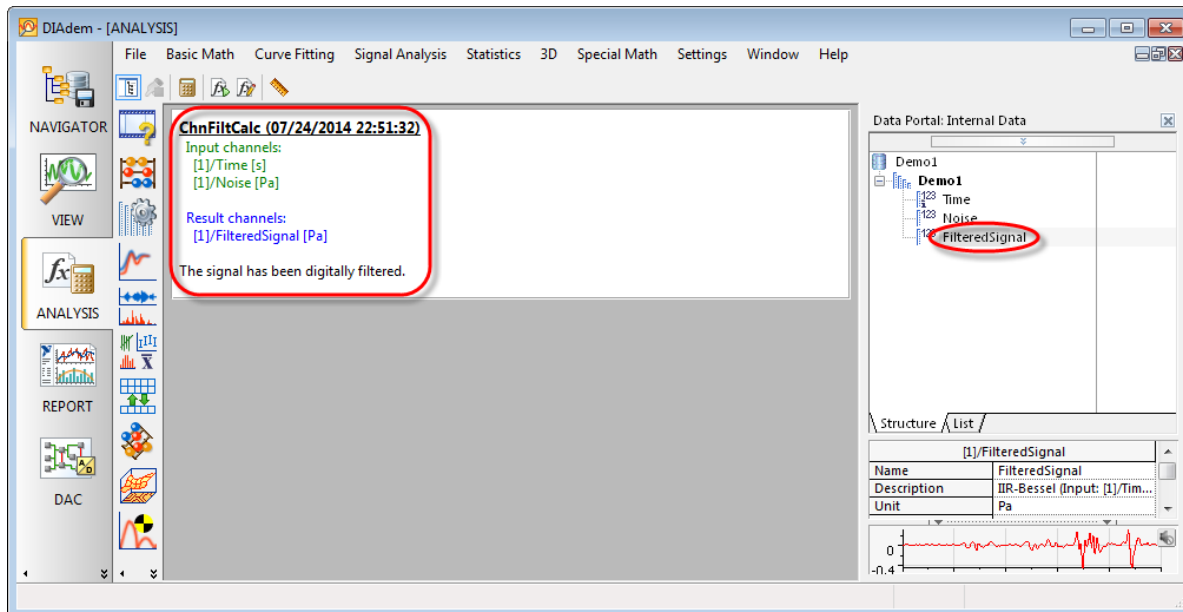
2.11 Note that the “Time” and “Noise” channels are automatically selected in the “Time channel” and “Signal channel” fields, respectively. Make sure the “Filter mode” field is set to “Lowpass” and type in “100” for the “Limit frequency [Hz]” value. Finally click on the “IIR Parameters” tab to set additional filter details.



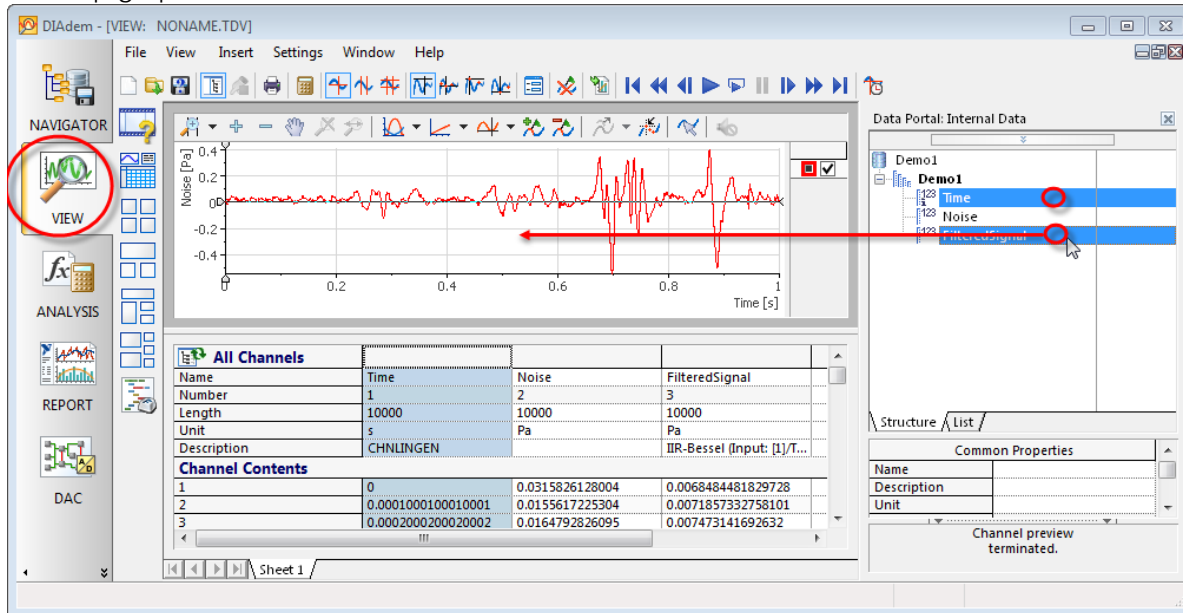
2.12 Make sure the “Filter type” is set to the default “Bessel” value, then **check** the “Force zero phase” checkbox— this will make the filtered waveform a better fit of the raw signal. Now **select** the “OK” button to execute the digital filter function.



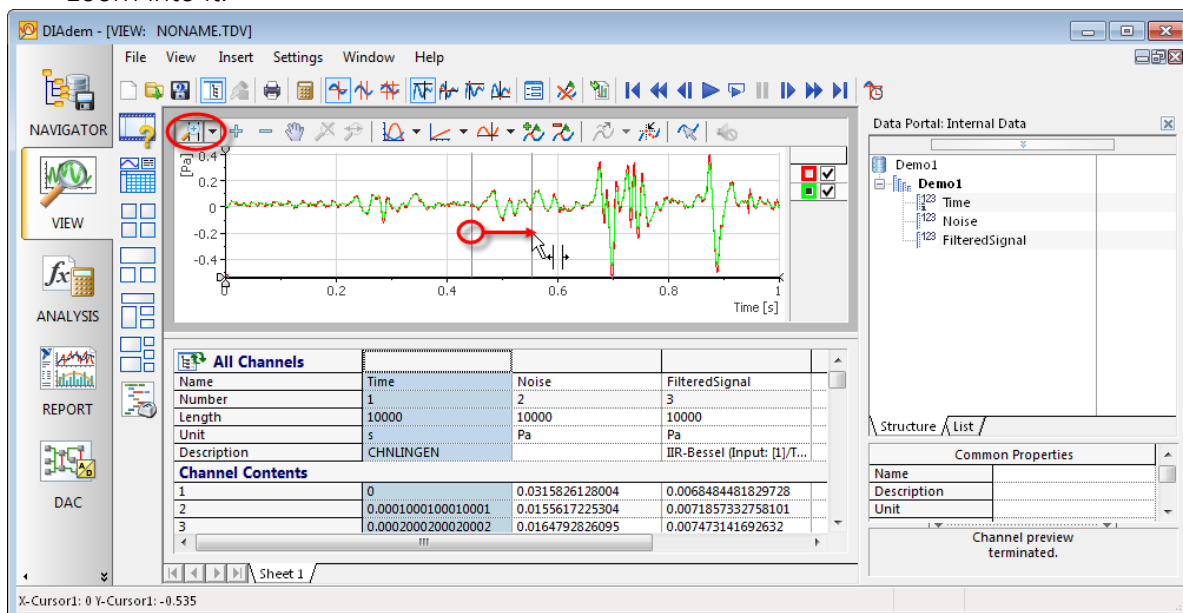
2.13 You can see that the resulting filtered signal is stored as a new channel in the Data Portal called “FilteredSignal”. The ANALYSIS panel also shows a log of the digital filter calculation you just executed.



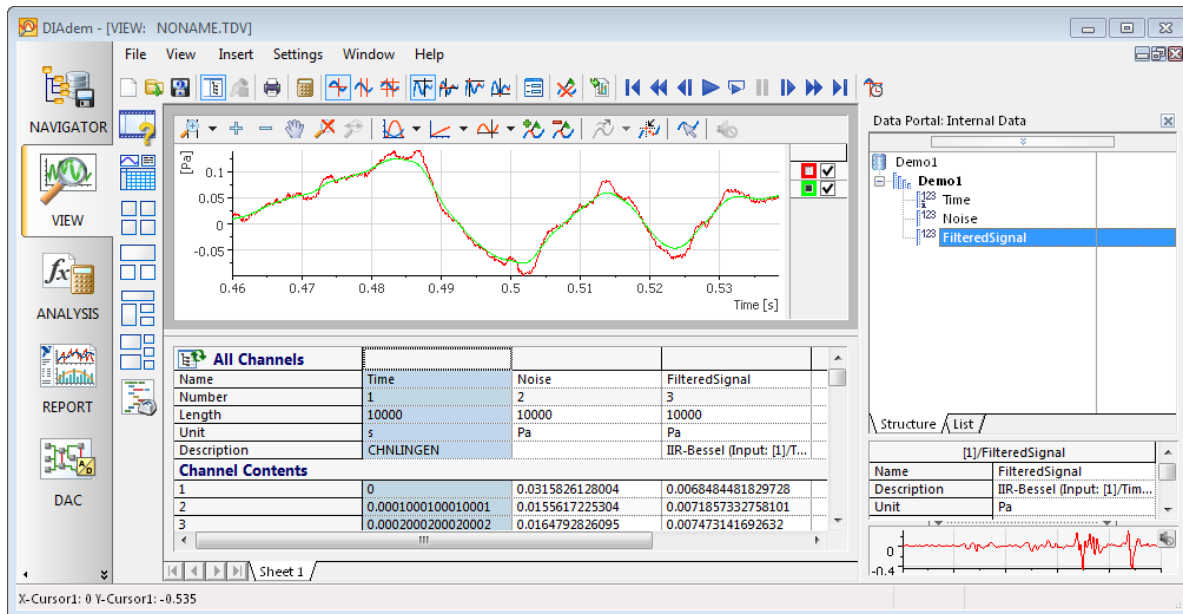
2.14 Click on the **VIEW** icon to switch back to VIEW. Then click on the “Time” channel in the Data Portal and hold down the <Ctrl> button while clicking on the “FilteredSignal” channel in the Data Portal— this selects only those two channels. Now drag the two selected channels into the top VIEW area to plot the newly calculated FilteredSignal channel vs. the original Time channel on the top graph.



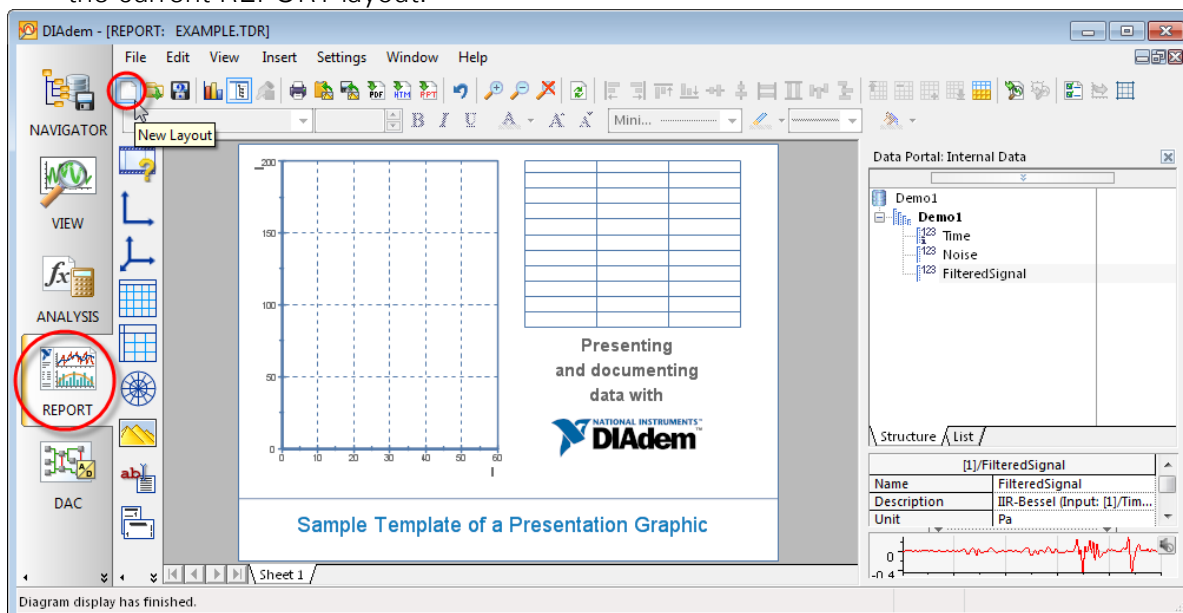
2.15 Now you can see the raw signal and the filtered signal side by side, but it is hard to see the difference at the full graph scale. Click on the “Band Zoom” icon at the top left of your screen, then click on the graph and drag the mouse to the right to outline a small time region in order to zoom into it.



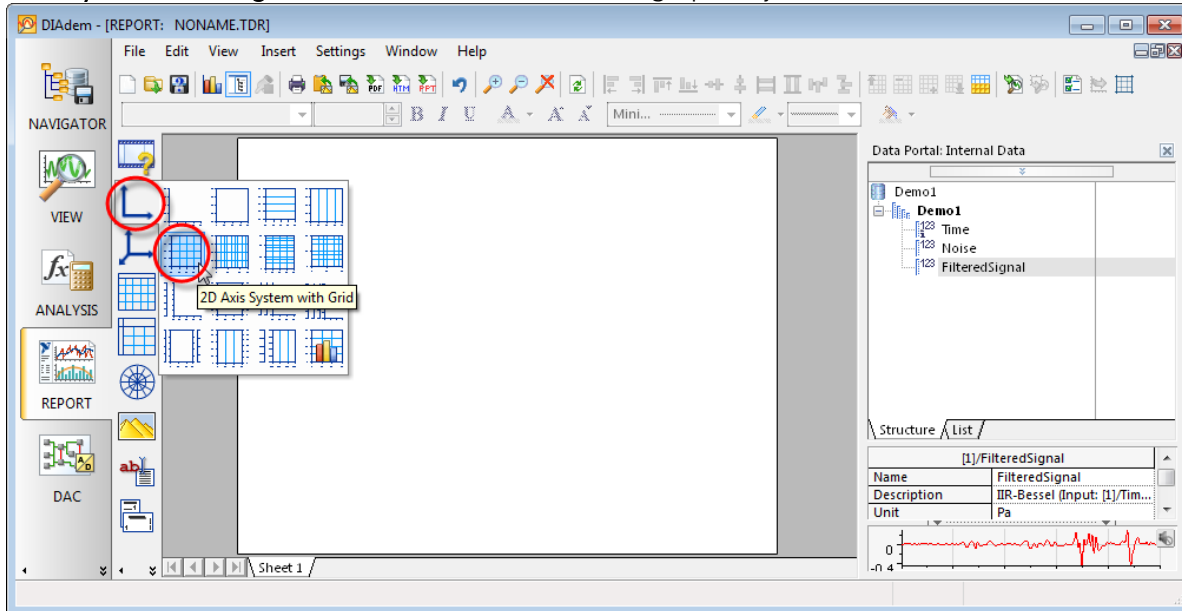
2.16 Now you see only the region you just highlighted with the mouse—and you see that the green digitally filtered signal is nearly the same as the red raw data signal, just much less noisy. You decide this is just the signal processing you need, and now you want to create a report of this data.



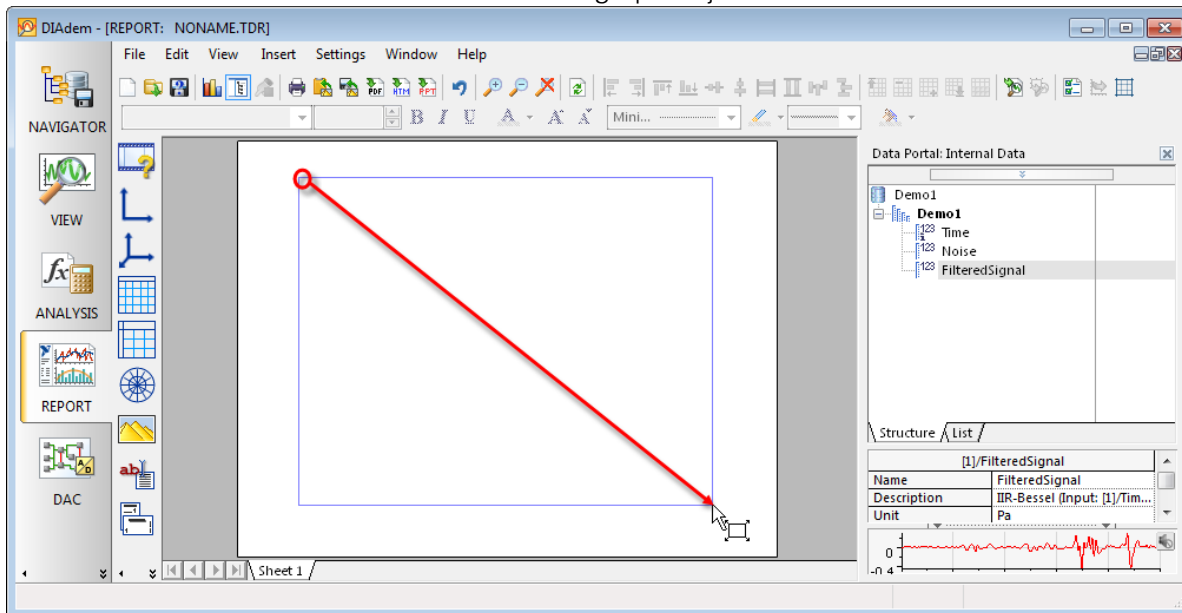
2.17 Click on the "REPORT" icon in order to switch to the REPORT panel, then click on the "New Layout" icon at the top left of your screen in order to clear the REPORT area of any previous sheets or REPORT objects. Click on the "No" icon if asked if you want to save your changes to the current REPORT layout.



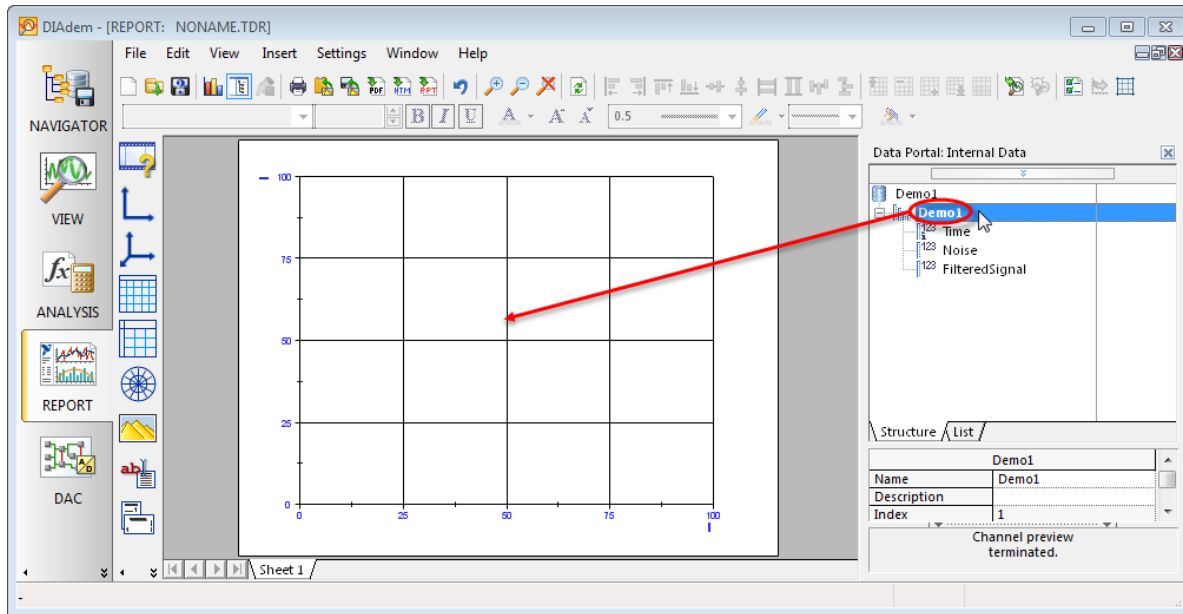
2.18 Click on the “2D Axis Systems” icon at the top left of your screen and select the “2D-axis systems with grid” to insert a new REPORT graph object.



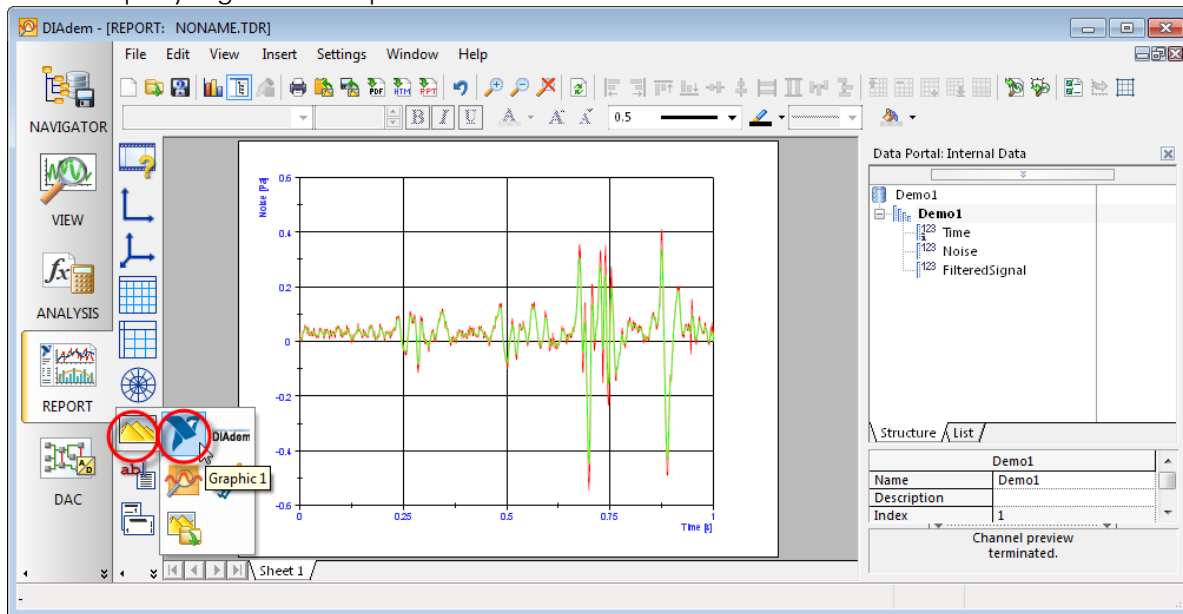
2.19 Click and drag your mouse from the top left to the middle right of the REPORT area in order to outline the location of the new REPORT graph object.



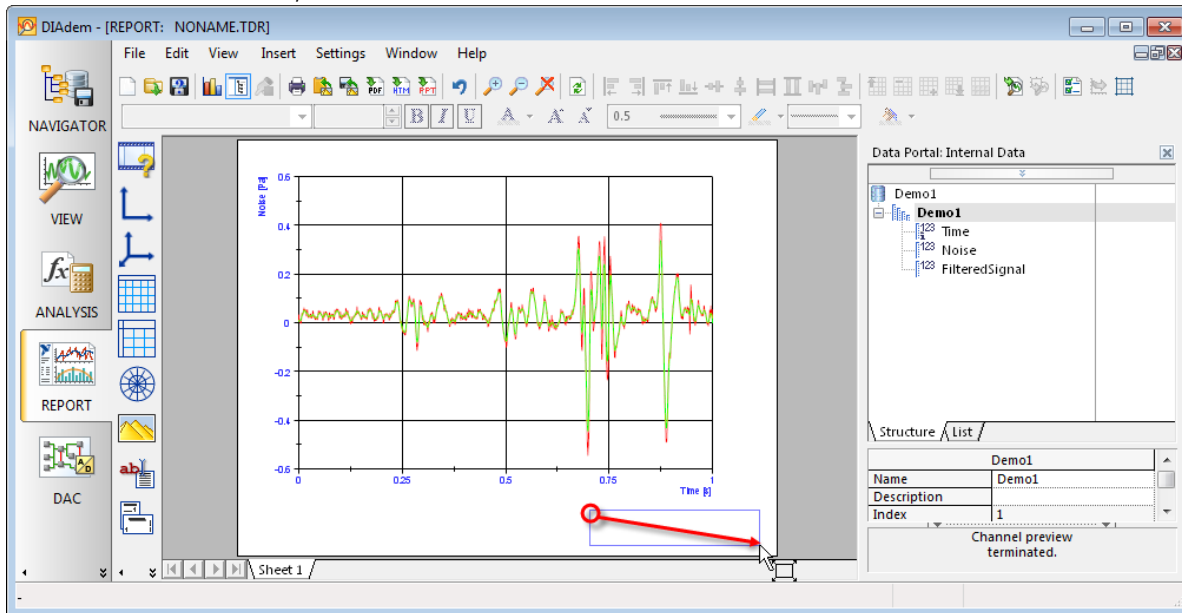
2.20 Drag the “**Demo1**” group from the Data Portal at the right of your screen into the new graph object. This automatically plots the “Noise” and “FilteredSignal” channels on the Y-axis vs. the “Time” channel on the X-axis.



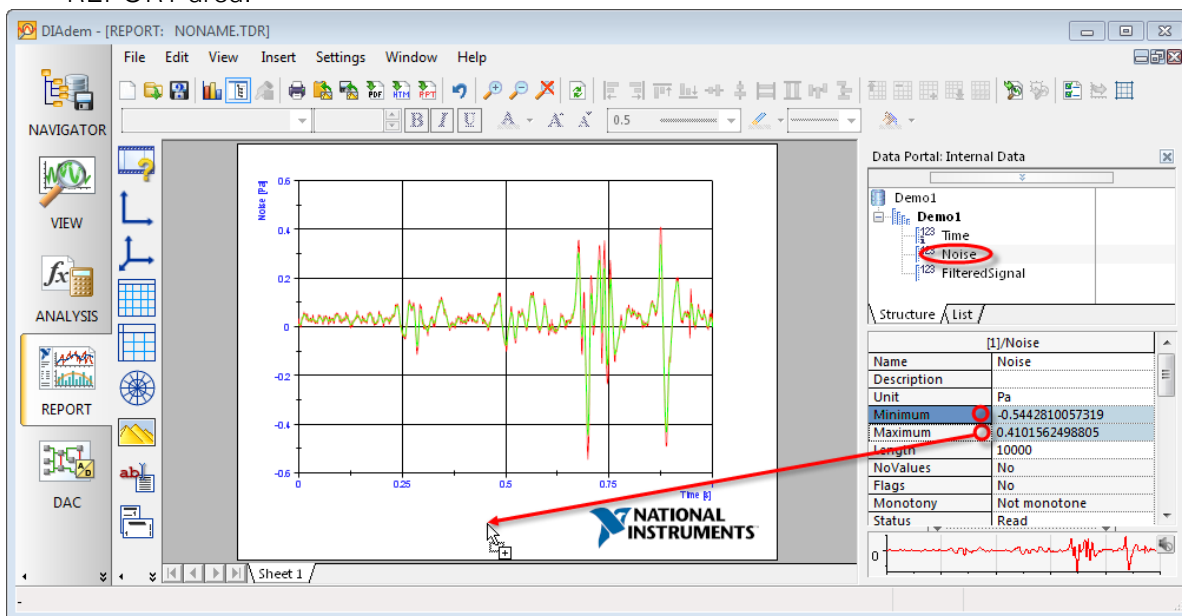
2.21 Click on the “Graphics” icon at the left of your screen, then select “Graphic 1” in order to add a company logo to the report.



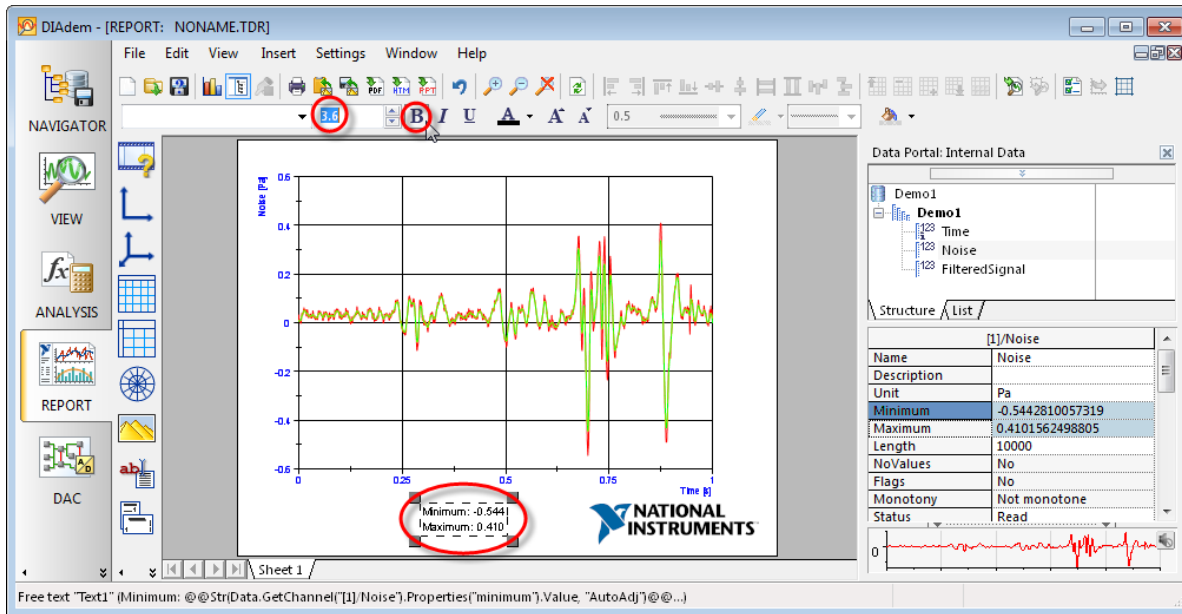
2.22 Click and drag your mouse where you want the **logo** to be— outline an area in the **bottom right** of the **REPORT** area, then release the left mouse button.



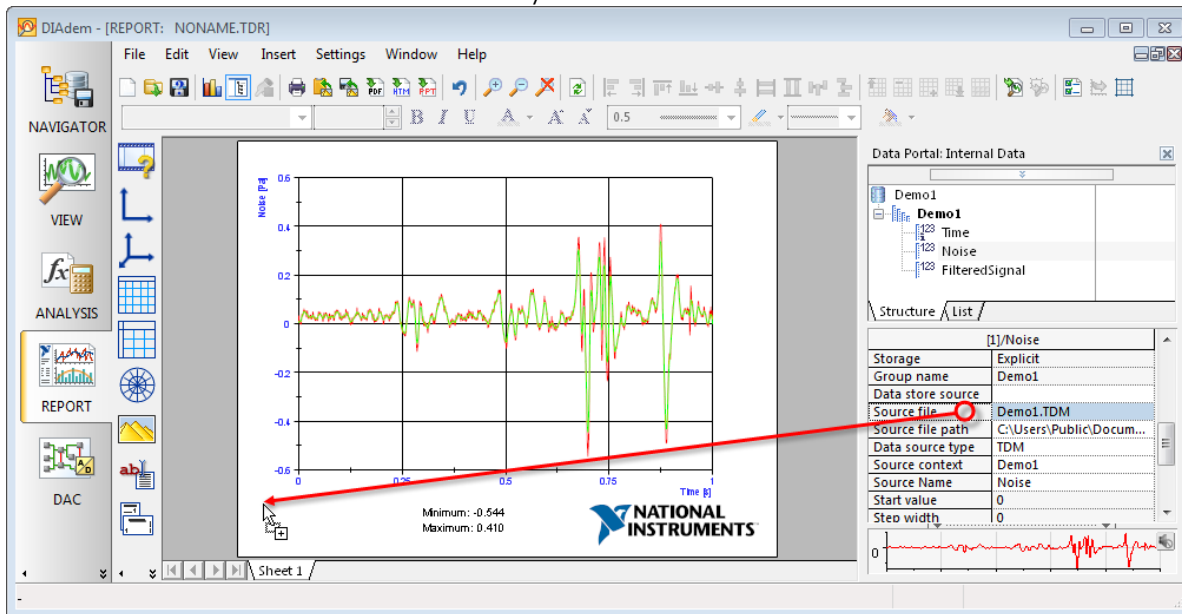
2.23 Click on the **"Noise"** channel in the Data Portal to select it, then look at its properties in the property table below it. Click on the **"Minimum"** property, then hold the **<Shift>** key down while selecting the **"Maximum"** property as well. Now drag both properties onto the **bottom** of the **REPORT** area.



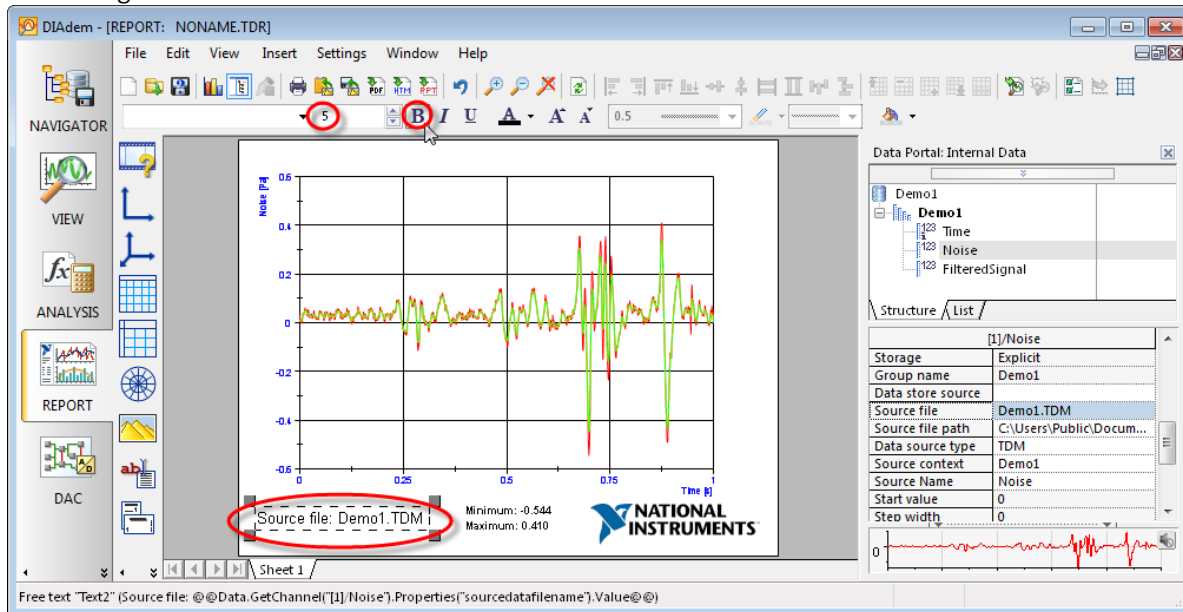
2.24 Click on the new **textbox** object that was automatically added to your REPORT area, then **change** the value of the “Font Size” field to **3.6** and **click** the “**Bold**” icon at the top of your screen to make the minimum and maximum values stand out.



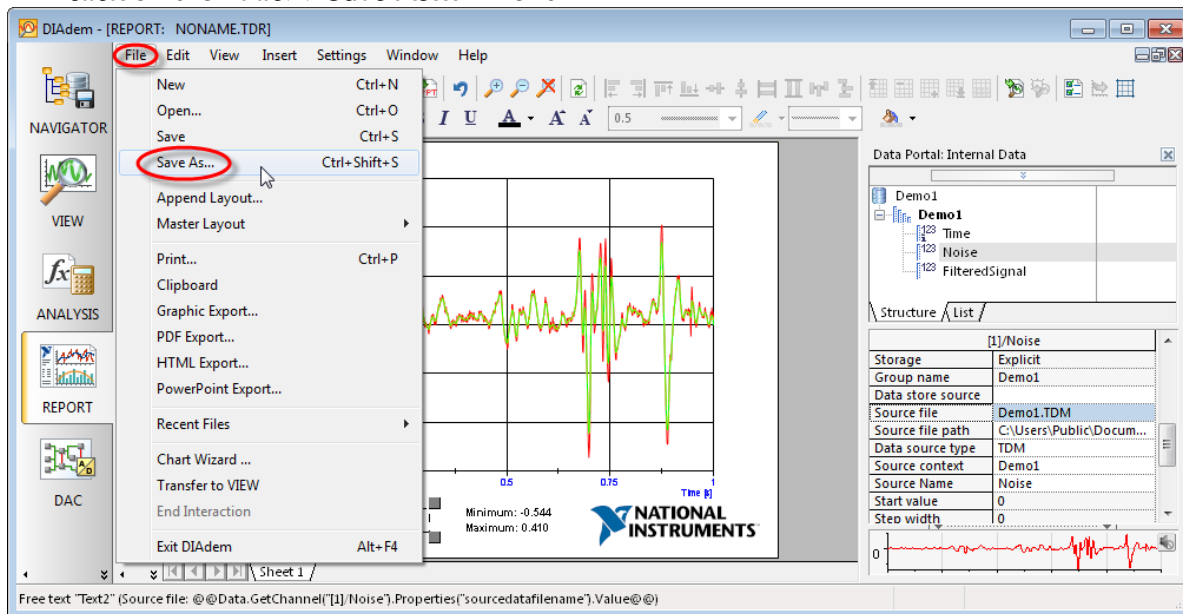
2.25 Click on the “Source file” property name, then **drag** it onto the **bottom left** of the REPORT area to add the file name to the REPORT layout.



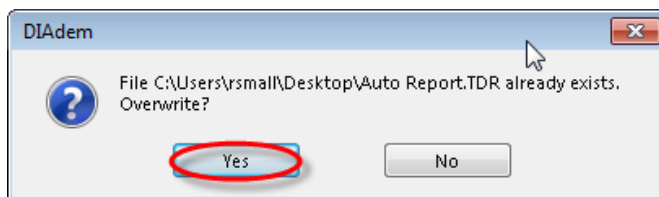
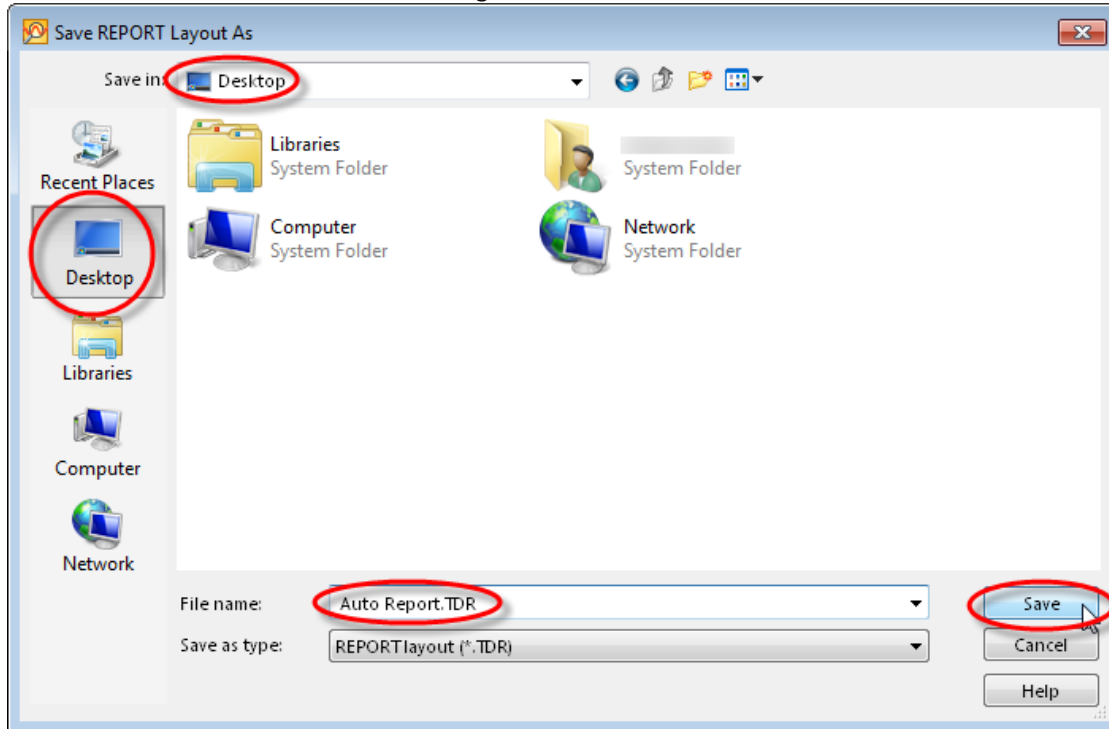
2.26 Click on the file name **textbox** object that was automatically added to your REPORT area, then **change** the value of the "Font Size" field to 5 and **click** the "Bold" icon at the top of your screen to again make it stand out.



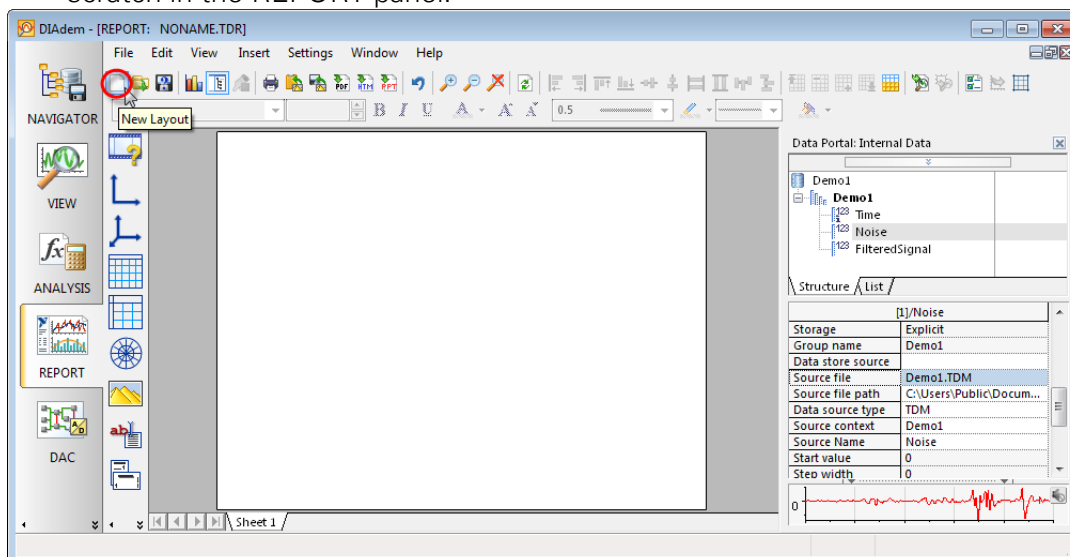
2.27 Now the report looks like you want it. What you really need is to quickly and easily create this sort of report for every new data set that comes in. To save this report template for future use, click on the "File>>Save As..." menu.



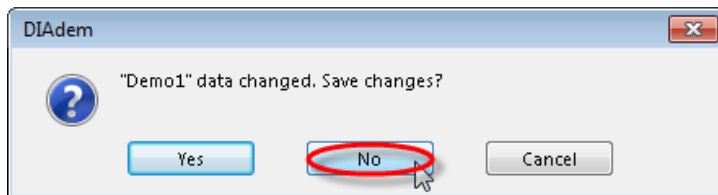
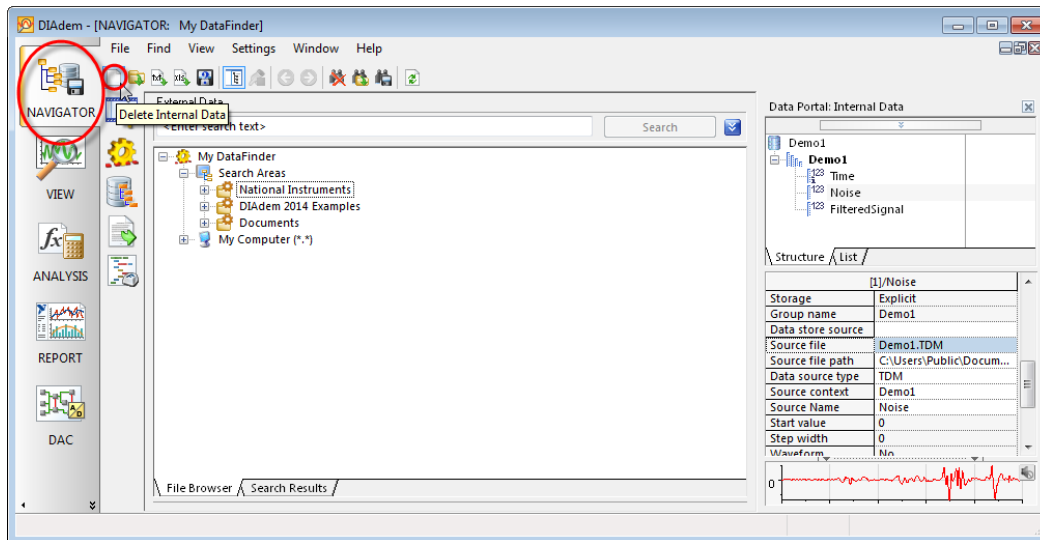
2.28 Navigate to the Desktop, name the file "Auto Report.TDR" and click the "Save" button. Click "Yes" if asked to confirm overwriting a file of the same name.



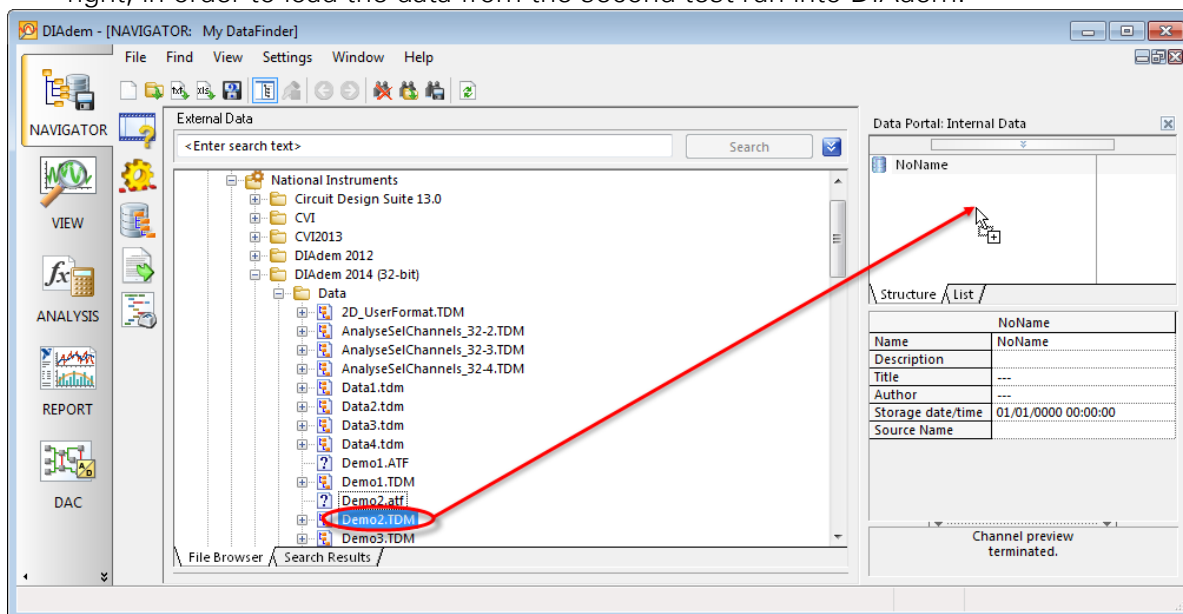
2.29 Now you will use the VBScript Recorder in DIAdem to easily retrace your analysis and reporting steps and turn them into a reporting script. First click on the "New Layout" icon to start from scratch in the REPORT panel.



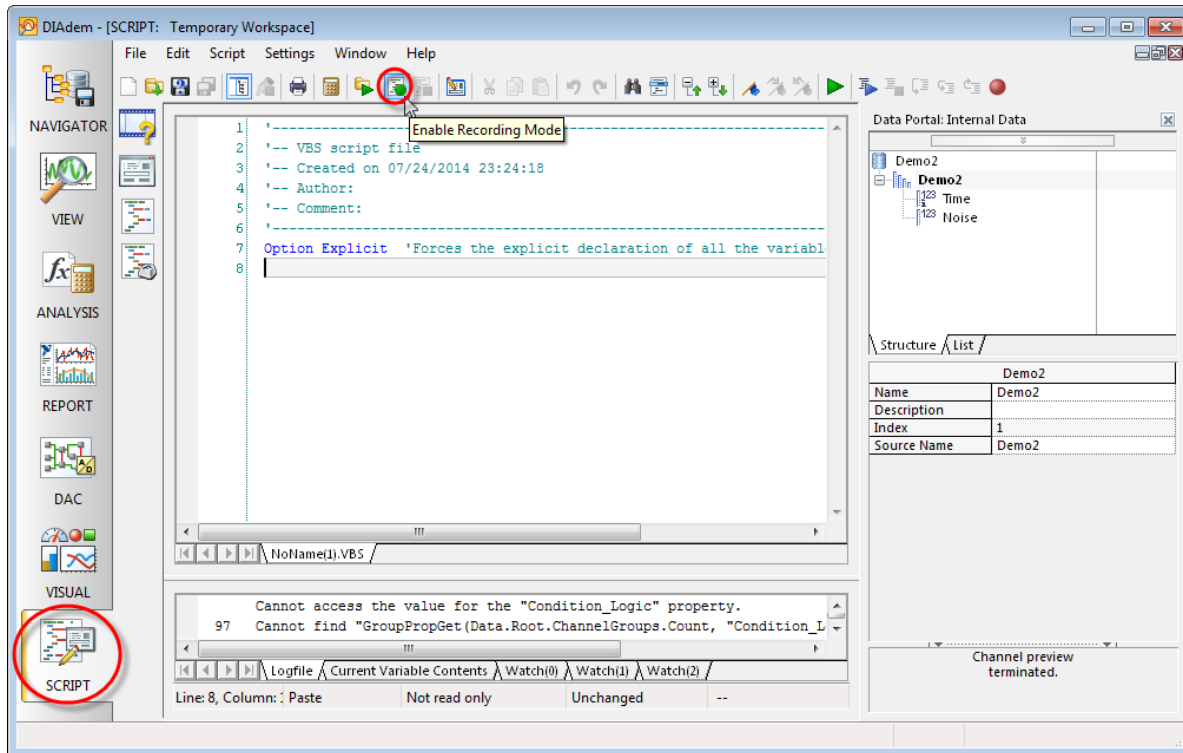
2.30 Click on the “NAVIGATOR” icon in order to switch to the NAVIGATOR panel, then Click on the “Delete Internal Data” icon at the top left of your screen in order to clear out the Data Portal and start with a clean slate. Click the “No” button if you are asked if you want to save changes to the data in the Data Portal.



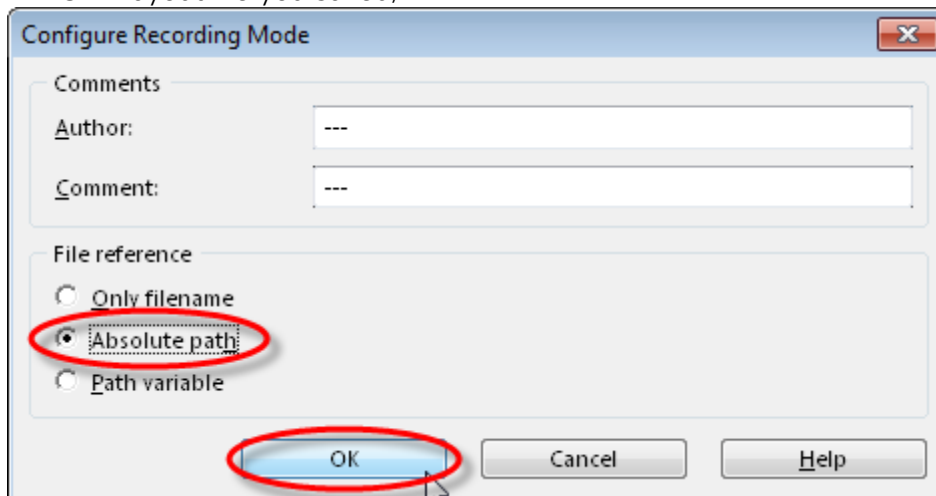
2.31 Drag the “Demo2.TDM” data file from the File Browser on the left into the Data Portal on the right, in order to load the data from the second test run into DIADEM.



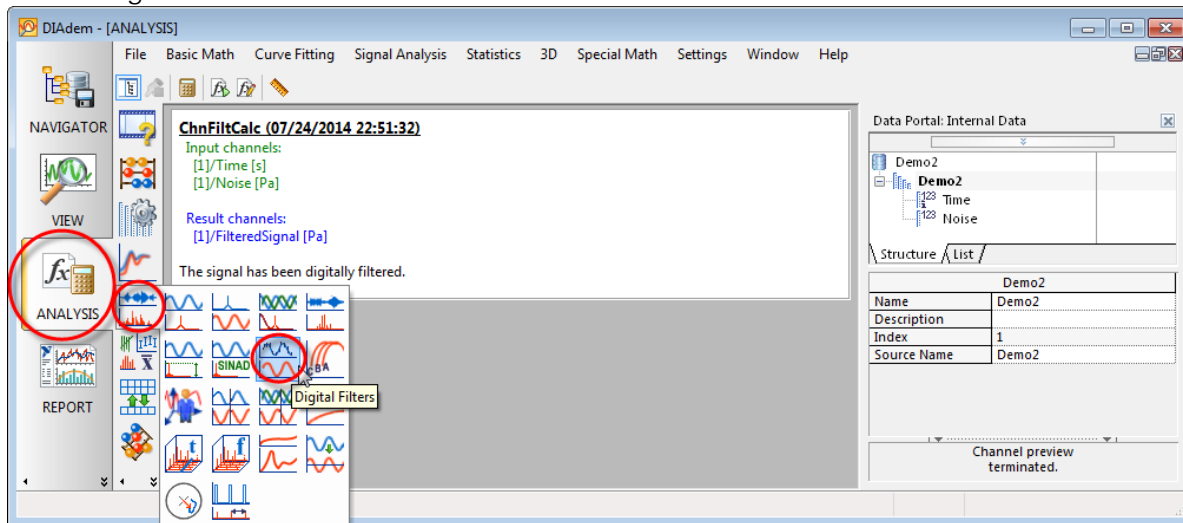
2.32 Click the “SCRIPT” icon at the left of your screen in order to switch to the SCRIPT panel. Click the “Enable Recording Mode” icon at the top of your screen in order to start the VBScript Recorder session.



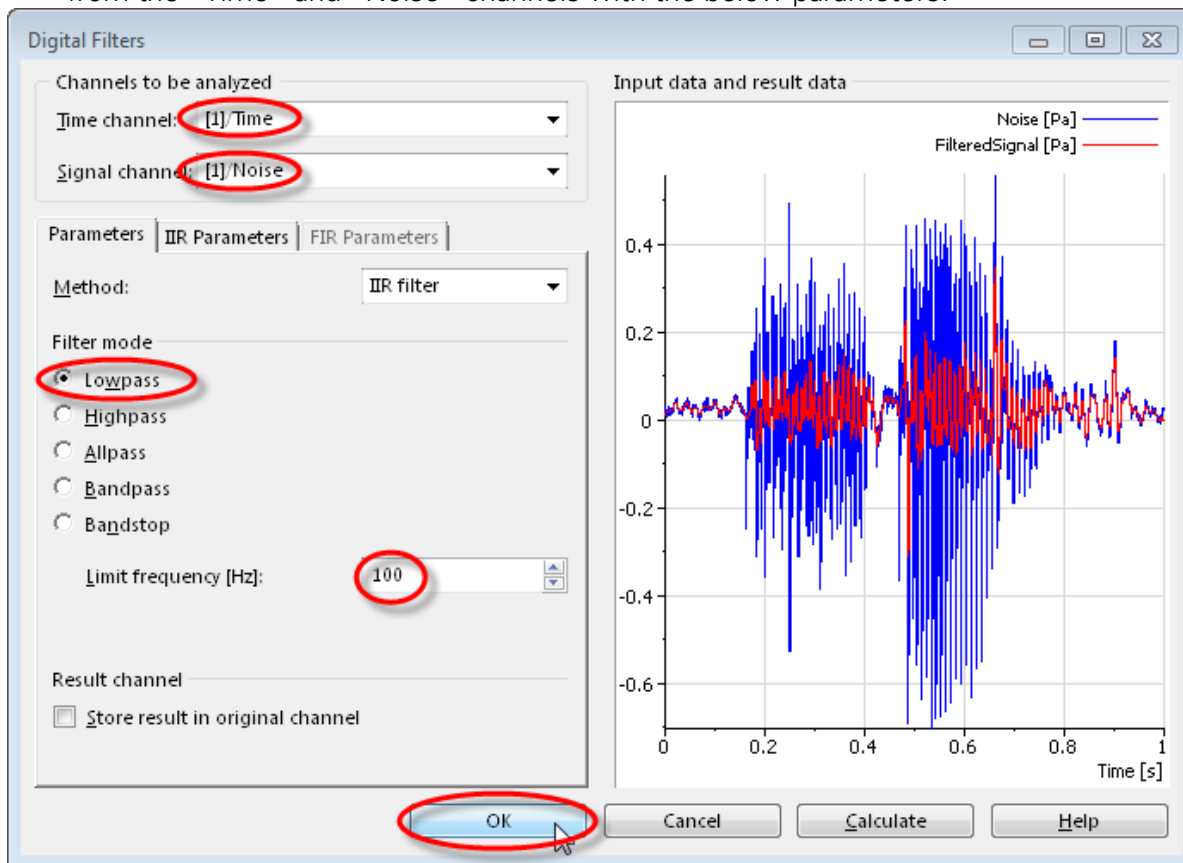
2.33 Select the “Absolute path” radio button and click the “OK” button. This instructs the Script Recorder to include the full file path to any resource files loaded or saved (in this case the REPORT layout file you saved).



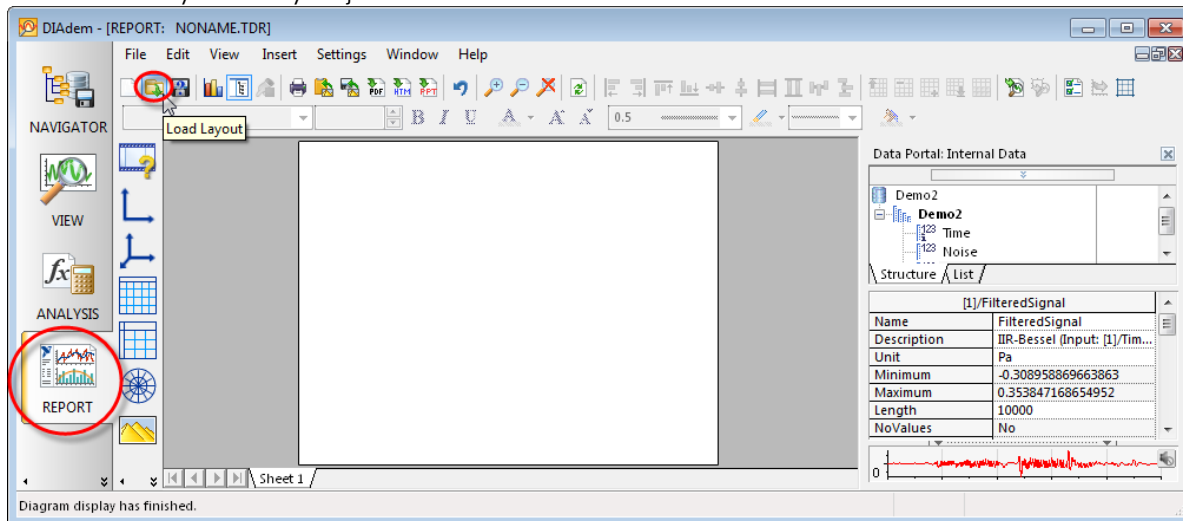
2.34 Now everything you do interactively will be automatically turned into VBScript code. Click on the “ANALYSIS” icon at the left of your screen to return to the ANALYSIS panel, click the “Signal Analysis” icon and select the “Digital filters” function to pop up the digital filter configuration dialog.



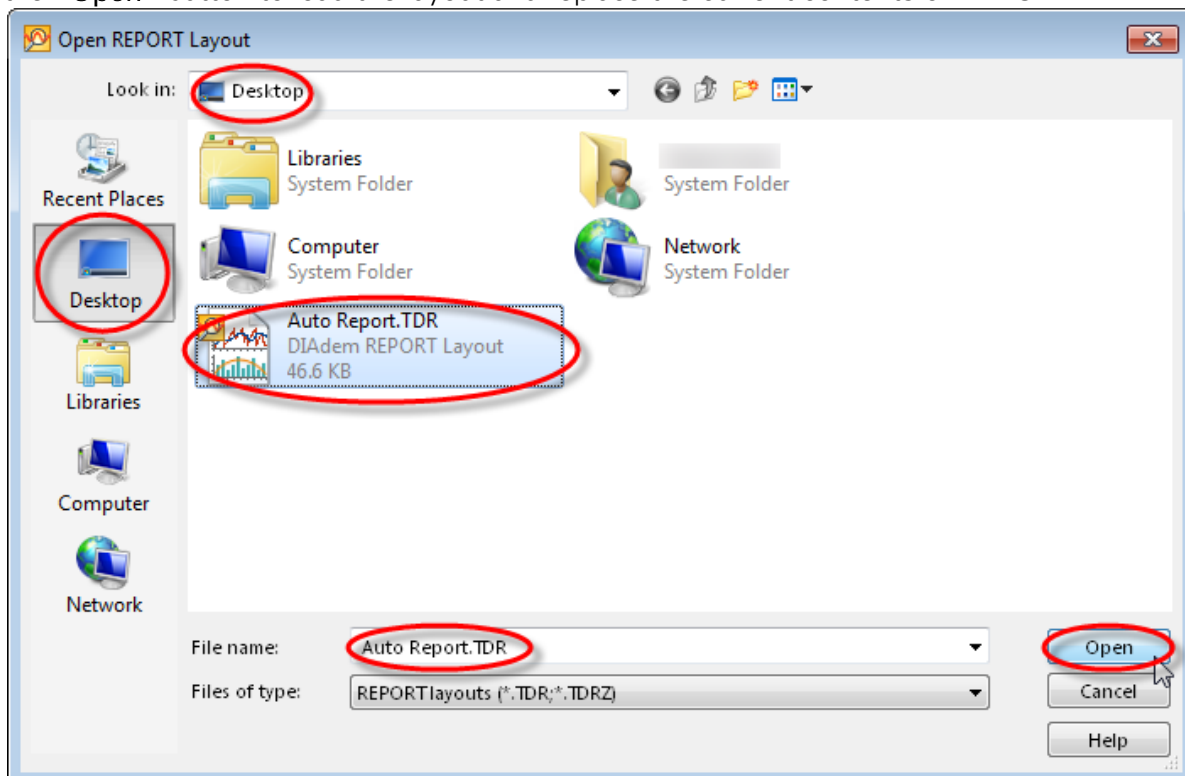
2.35 Verify that all your settings are the same from the last digital filter you ran, then click on the “OK” button to execute the digital filtering for this second data set. A new command line will now automatically appear in the VBScript you are recording which calculates a “FilteredSignal” channel from the “Time” and “Noise” channels with the below parameters.



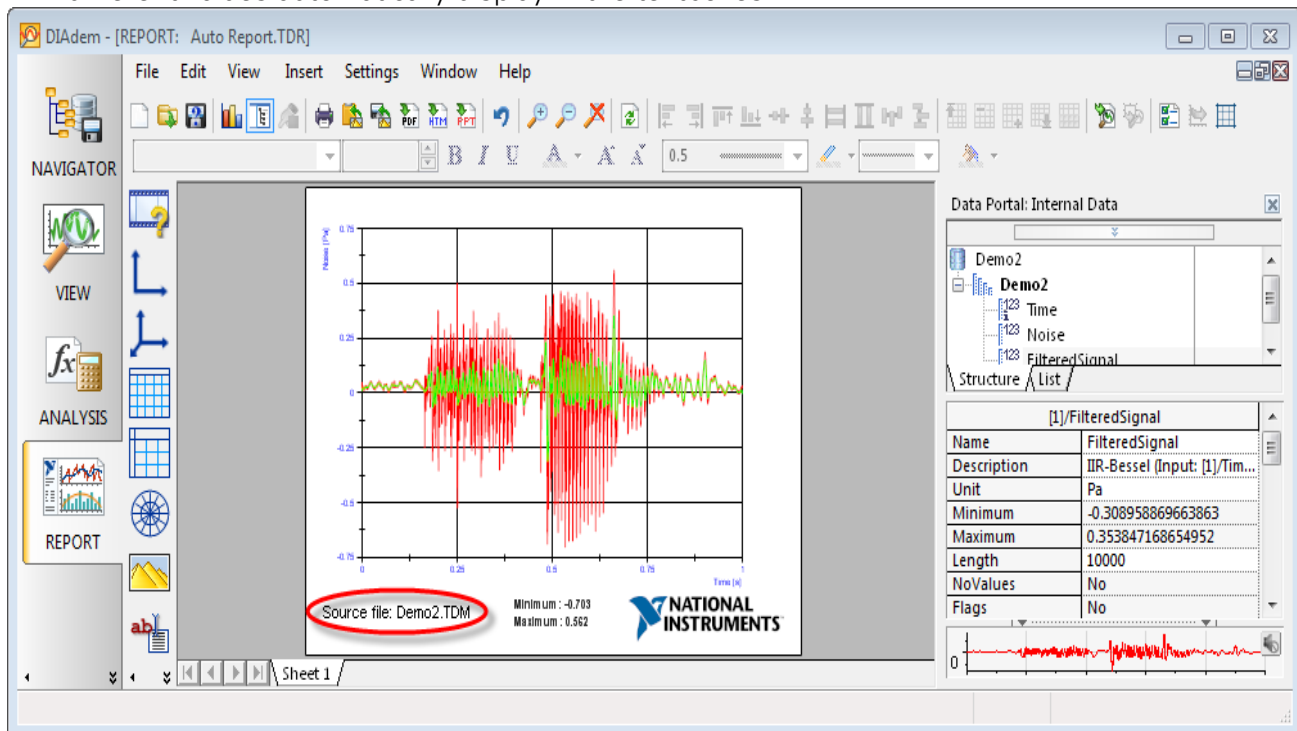
- 2.36 Click on the **REPORT** icon at the left of your screen in order to switch back to the REPORT panel. Now that you have created the filtered channel, all you have left to do is load the REPORT layout file you created. Click on the “**Load Layout**” icon at the top left of your screen in order to load the *.TDR layout file you just saved.



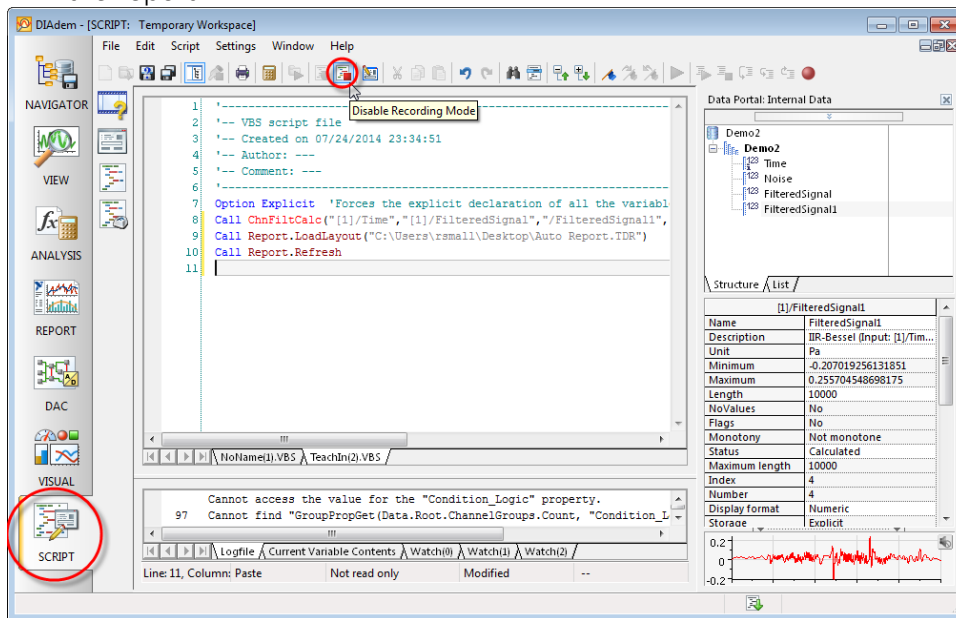
- 2.37 Navigate to the **Desktop**, select the “**Auto Report.TDR**” layout file you saved earlier, then click on the “**Open**” button to load the layout and replace the current contents of REPORT.



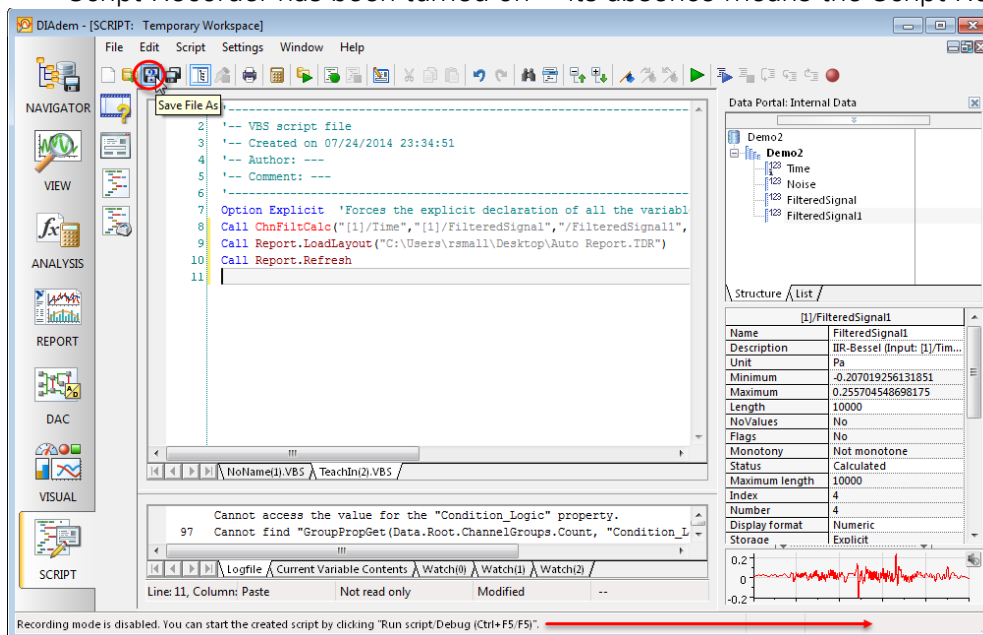
2.38 The format of the report you see now should be identical to that which you saved into the *.TDR file, but notice that the raw and filtered data traces are shaped quite differently than they were before, and the Source file, Minimum and Maximum properties are also different. This is because the *.TDR layout file stores the information that there is a graph on top with the curves “Noise” vs. “Time” and “FilteredSignal” vs. “Time”. If there is a different set of channels in the Data Portal, the curves on the graph will look different, though they will have the same color, line style, background grid, etc. Similarly, the *.TDR layout file stores that there is a textbox below the graph where the “Source file” property of the “Noise” channel is displayed and another textbox where the “Minimum” and “Maximum” properties of the “Noise” channel are displayed. If those properties are different in the Data Portal because new channels have been loaded, then different values automatically display in the textboxes.



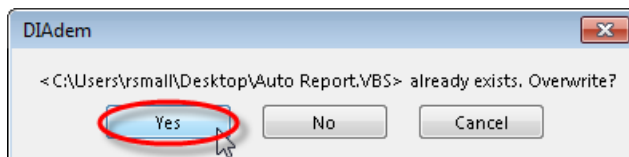
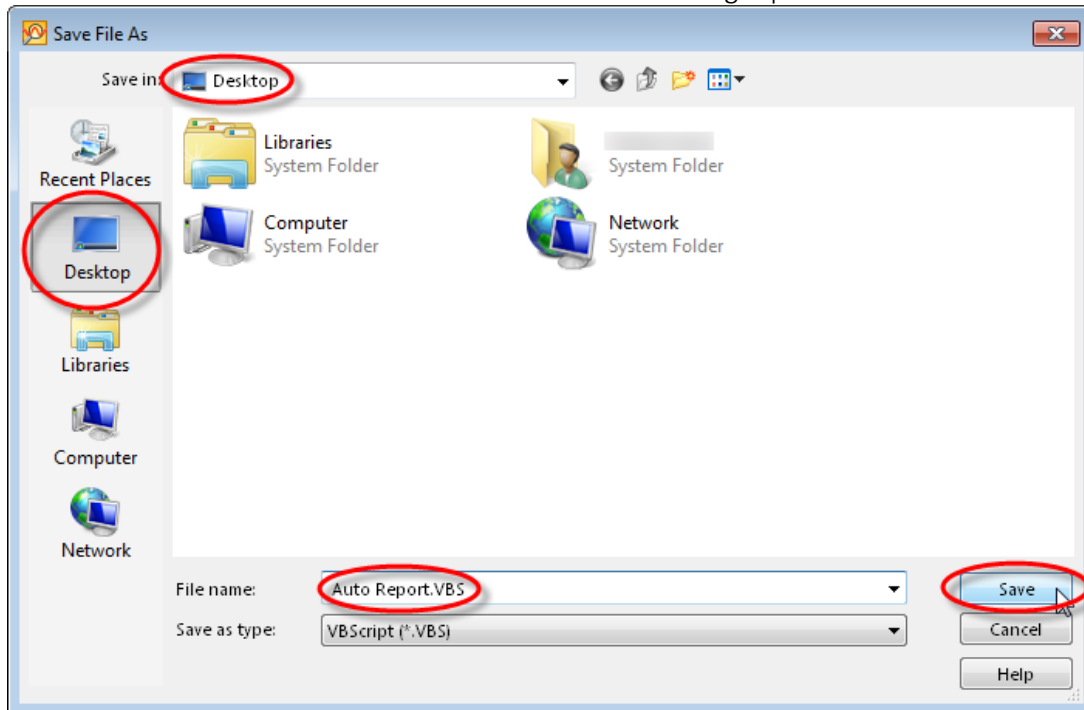
2.39 Now you are done recording your report script. Click on the “SCRIPT” icon at the left of your screen in order to switch back to the SCRIPT panel, then click on the “Disable Recording Mode” icon at the top of your screen in order to stop your VBScript Recorder session. Notice that you now have a VBScript with 3 red DIAdem commands in it— the first line calculates the “FilteredSignal” channel, the second line loads the *.TDR layout file, and the third line refreshes the report.



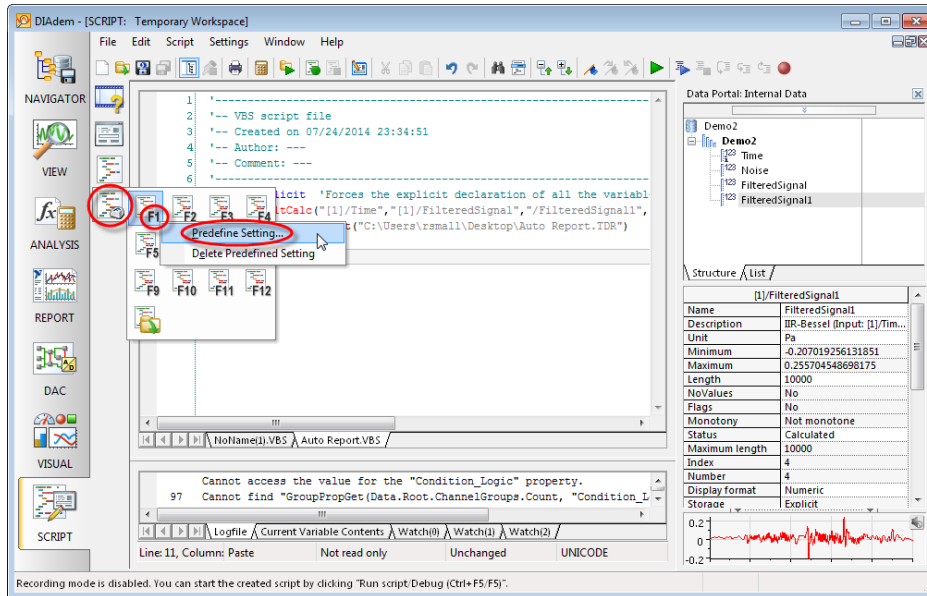
2.40 You will want to use this VBScript again, so click on the “Save File As” icon at the top left of your screen in order to save it. Notice that during the Script Recorder session a corresponding icon appears in the bottom right of your screen so that you can always tell at a glance whether the Script Recorder has been turned on— its absence means the Script Recorder is done.



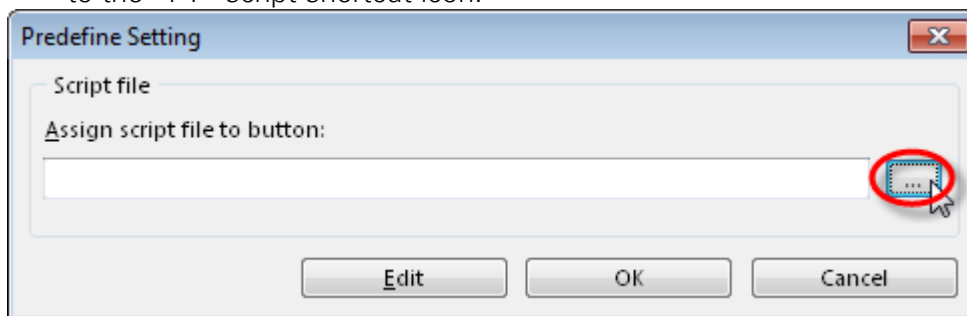
2.41 **Navigate** to the **Desktop**, name the file **"Auto Report.VBS"**, then **click** on the **"Save"** button—click on the **"Yes"** button if asked to confirm overwriting a previous file of the same name.

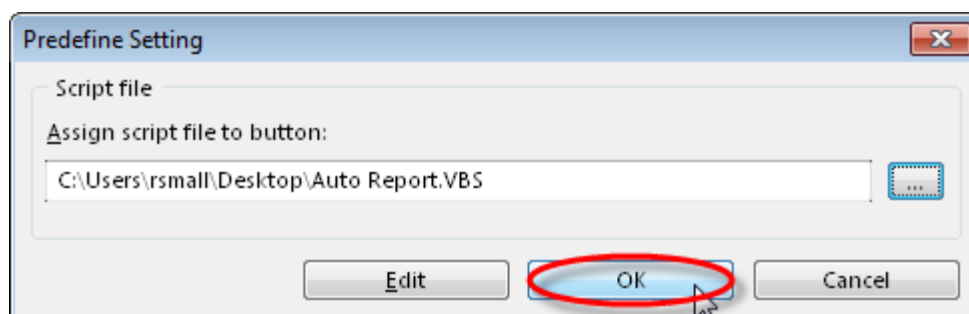
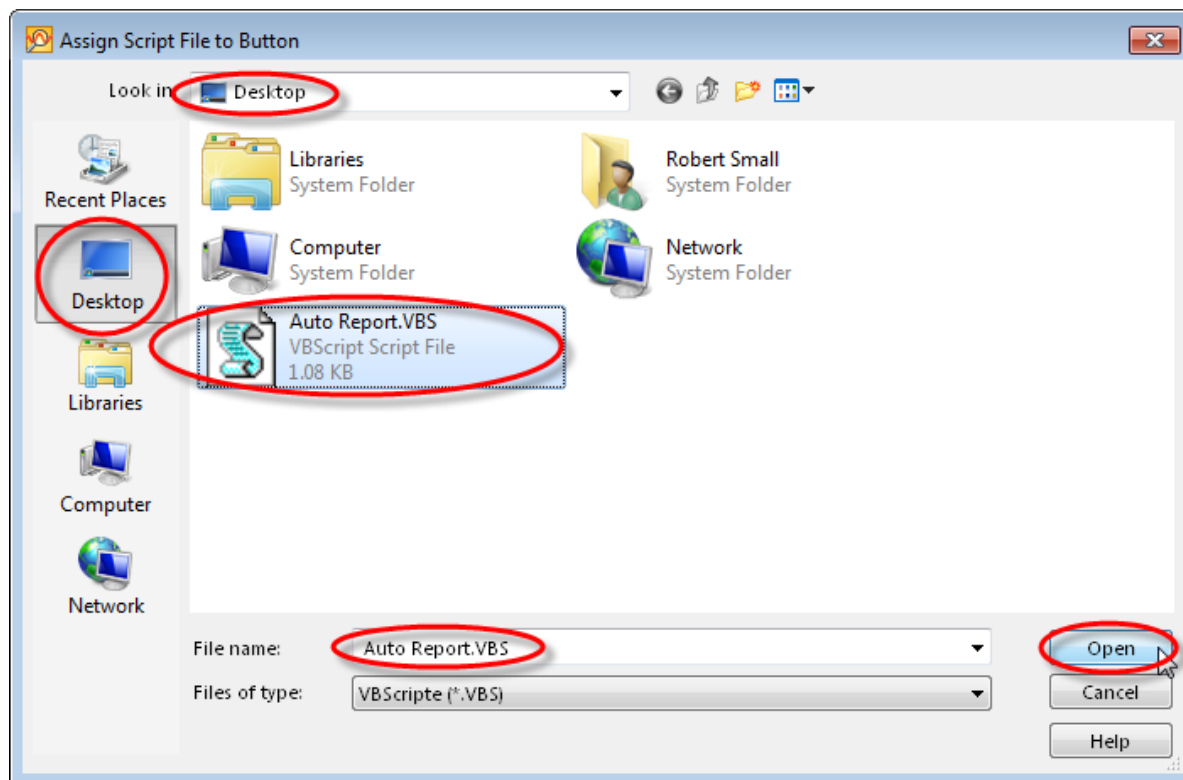


2.42 You will be using this reporting script you just created quite a lot, so you want to assign it to one of the script shortcut keys so you can run it easily from anywhere in DIAdem. Click on the small “DIAdem Scripts...” icon at the top left of your screen, then right-click on the “F1” script icon just to the right of it and select the “Predefine Setting...” menu to assign your VBScript to this “F1” shortcut icon.

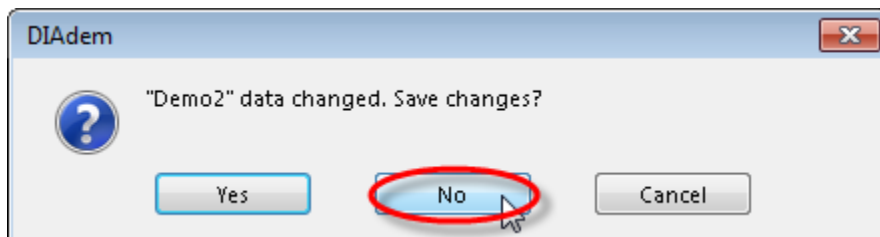
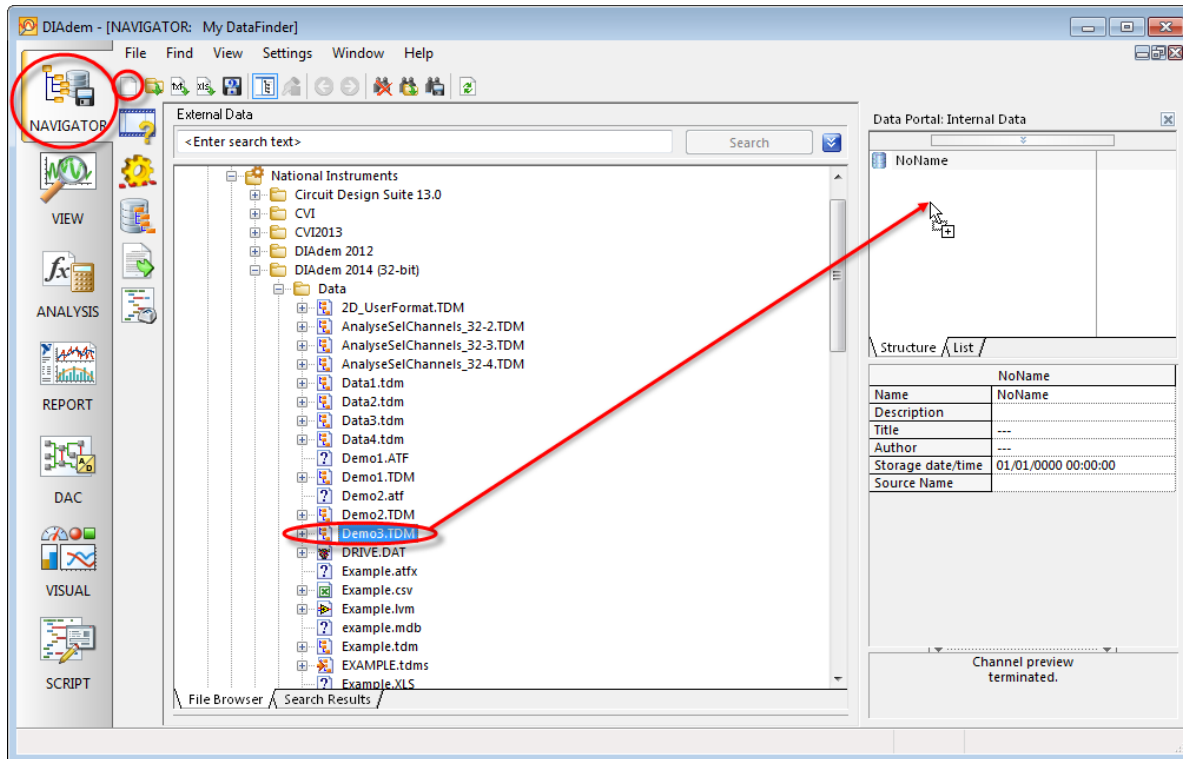


2.43 Click on the [...] button at the right of the dialog to launch the file selection dialog. Navigate to the Desktop and select the “Auto Report.VBS” script file you just saved, finally click on the “Open” button in this dialog and the “OK” button in the previous dialog to finish assigning your VBScript to the “F1” script shortcut icon.

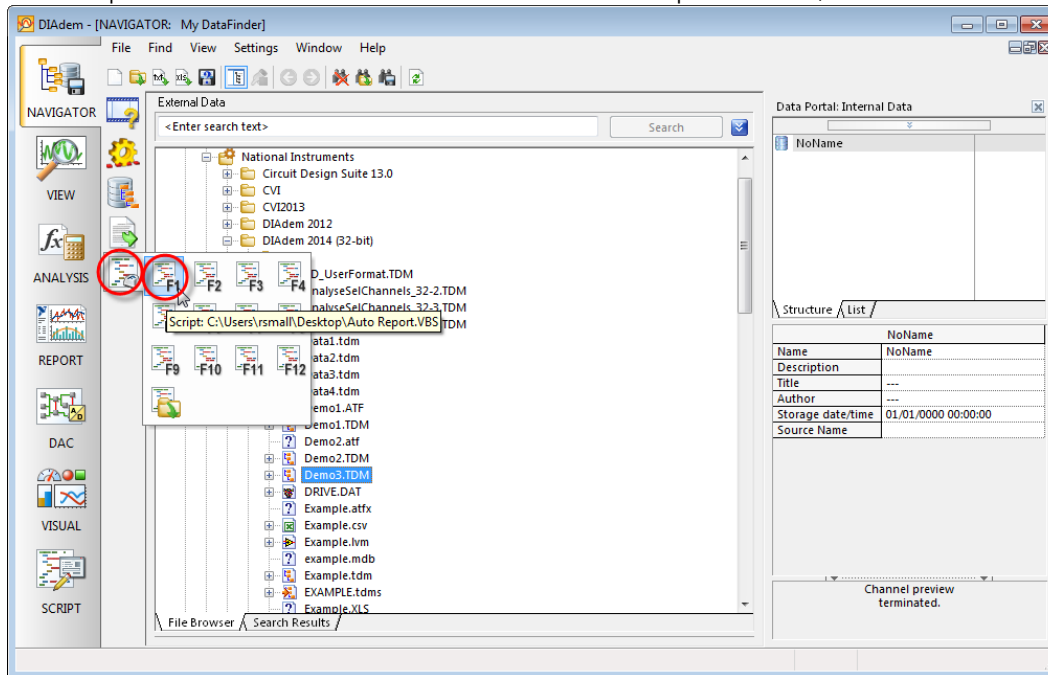




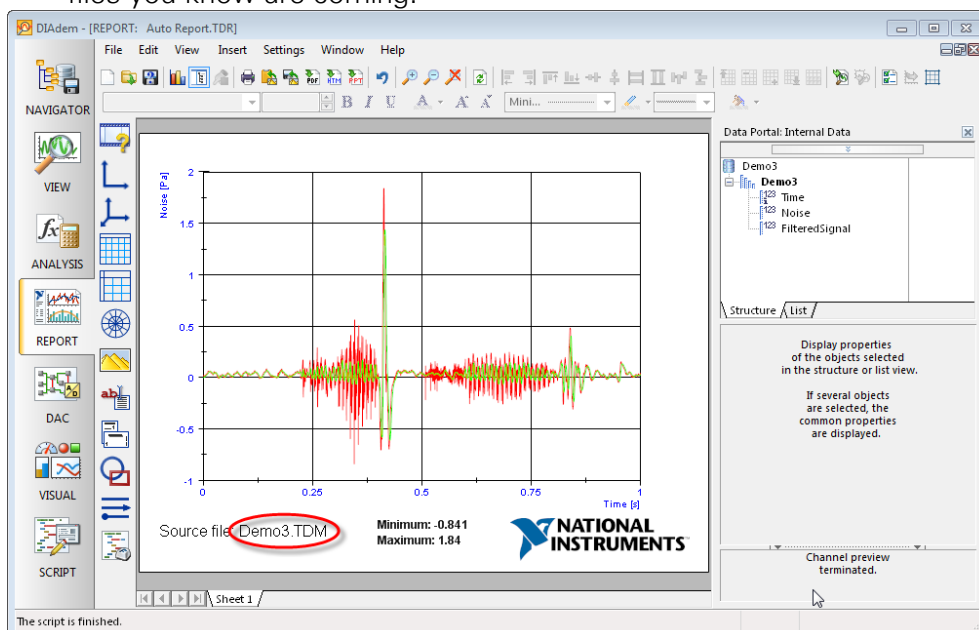
2.44 Now you can practice using your new reporting script with the third data set. Click on the "NAVIGATOR" icon in order to switch back to the NAVIGATOR panel, then click on the "Delete Internal Data" icon to delete the channels from the second data set. Click on the "No" button when asked if you want to save the changes you made to the second data set. Finally, drag the "Demo3.TDM" file into the Data Portal to load it.



2.45 Click on the “DIAdem Scripts” icon at the left of your screen, then **select** the F1 “Auto Report.VBS” script icon to easily run your reporting script on this third data set. (The keyboard sequence <Shift F1> also launches this VBScript shortcut)



2.46 Notice that the reporting script automatically calculated the “FilteredSignal” channel and displayed the new data traces as well as the new file name and min/max values. Try repeating the last two steps with each of the “Demo#.TDM” data files and verify that you can quickly and easily generate this report, and that while the form of the report is the same every time, the detailed content is different every time. You are now ready for the new test rig roll-out and all those data files you know are coming.



Congratulations! You have just finished the DIAdem Hands-On exercise set.

Now you have a set of basic knowledge that is needed to use DIAdem, so you can download evaluation version of DIAdem from <http://www.ni.com/diadem/try/> and start your first real project!

However, DIAdem environment covers so many areas that there is always something new to explore and learn. If you want to take a professional training with NI Instructor, go to the webpage www.ni.com/training, or even better – contact your local Sales representative, who can advise you which course is suitable for your needs.

Thank you for your participation!

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