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How to Derive Load on a Six Vibrating Wire Gage Load Cell MultiLogger Application Note #3

Overview

Most vibrating wire load cell manufacturers base the gage factor for load cells on the average of the readings of the individual gages. It is straightforward to connect the load cell to the multiplexer, configure MultiLogger and begin to monitor the readings. But in order to convert from frequency to load it's necessary to find the average of the six readings, subtract the zero reading and apply the gage factor to that number. This can be accomplished with a MultiLogger Processing File.

A Processing File is simply a list of additional instructions that execute after the instruments on a mux (or instruments that are directly connected) are all read, and after any math or conversion units have been applied. Press the  button located on the channel configuration form to access the Processing File/Extended Properties form. The MultiLogger help file contains much more information on the Processing File/Extended Properties form, but in short, this form allows the selection of a Processing File (the instructions that will execute) and the entering of any Extended Properties that are associated with that file.

In order to generate a load value in engineering units for the load cell we will use a Processing File that will find the average of those gages, subtract the zero reading and apply the gage factor. The load will be displayed in the first vibrating wire gage channel of the load cell. In cases where several load cells are to be factored this file can be used to factor any or all of the load cells.

The purpose of this Application Note is to provide the user with information on how to build and implement this file. The following steps are necessary:

- 1) The Processing File must be built and stored in the MultiLogger program directory, usually Program Files\MultiLogger.
- 2) The file name must be added to the [Processing Files] section of the MultiLogger setup file.
- 3) The file must be selected in the Processing File/Extended Properties form.
- 4) The gage factor and zero reading must be entered in the File Properties form


Detailed instructions for each of these steps follows in this MultiLogger Application Note.

- 1) Build the Processing File called Convert6ChannelsToLoad.ins using the MultiLogger Editor (press the setup button in MultiLogger, press New, select Instruction File). The file is listed at the end of this MAN (MultiLogger Application Note). Alternately the file may be copied as received via e-mail or other means to the MultiLogger directory.
- 2) This file must be added to the multilogger.ini setup file. Close the editor after completing the above modifications and saving. Press the Setup button in MultiLogger. Scroll down to the **[Processing Files]** section. Note the last entry and add an entry with the following format:

File#n=Convert 6 Channels to Load,Convert6ChannelsToLoad.ins

For **n** simply increment that last number shown by one. Press Save, close the Editor.

Note: When future updates are applied to the installed version of MultiLogger these settings should remain after the update completes

- 3) Select the channel to which the first load cell gage is attached in the Configure Channels form. Click the Processing File/Extended Properties button. Pull down the list from the Processing Files list box to see the available files. If Step 2 above was successful "Convert 6 Channels to Load" should be in the list. Select that file.
- 4) You will see that two locations have a dark blue background in the File Properties list. This is because MultiLogger can't find a value for ZeroReading or GageFactor. Enter the initial load cell reading in "digits" in the Value column beside ZeroReading. It's always recommended that the field zero be used. Again, this is the average of the six individual gage readings. There are two ways to find this number: (a:) Configure MultiLogger for the appropriate gage type, enter a gage factor of 1 and a zero reading of 0 for each of the six channels, monitor the readings, and calculate the average. (b:) Read the individual gages with a readout box and calculate the average from those readings. Enter the factory supplied gage factor in the Value column beside GageFactor as a **negative number**. (You will see from the load cell calibration sheet that as the load increases the digits reading decreases. This indicates a negative slope or an inverse relationship. This is why the gage factor should be entered as a negative.) When you Accept the changes and the window closes you will notice that the button above the Processing Files/Extended Properties button now displays enabled . BE SURE that all of the six channels to which the load cell gages are attached have a Gage Factor of 1 and a Zero Reading of 0 in their channel configurations.

In order to derive load for additional load cells on the multiplexer repeat steps 3) and 4) above.

When you have programmed the multiplexers and made the changes described above click the UpDate icon to create and download the program the datalogger.

Instruction File Convert6ChannelsToLoad.ins

```

;-----
;Processing File to calculate load on a 6-gage load cell
;load value
P30  Z=F          ;
1:[ZeroReading    ]  F      ;zero reading
2:[0              ]  Exponent of 10      ;no exponent
3:[ScratchLoc2    ]  Z Loc ;scratch location

;load the gage factor
P30  Z=F          ;load factor
1:[GageFactor     ]  F      ;gage factor
2:[0              ]  Exponent of 10      ;no exponent
3:[ScratchLoc3    ]  Z Loc ;scratch location

;calculate the average of the six gage readings
P51  Spatial Average ;
1:[6              ]  Swath ;number of vw gages in cell
2:[MuxReadingLoc++]  First Loc ;
3:[ScratchLoc1    ]  Avg Loc  ;average of 6 gages

;subtract the zero reading
P35  Z=X-Y        ;subtraction
1:[ScratchLoc1    ]  X Loc  ; average of 6 gages
2:[ScratchLoc2    ]  Y Loc  ;zero reading
3:[ScratchLoc1    ]  Z Loc  ;scratch location

```

```
;multiply by factor  
P36  Z=X*Y           ;multiplication  
1:[ScratchLoc3      ]  X Loc   ;gage factor  
2:[ScratchLoc1      ]  Y Loc   ;average of 6 gages  
3:[MuxReadingLoc++ ]  Z Loc   ;Input Location of first gage
```

Advanced Options

It's easy to modify this processing file to work with three or four gage load cells. Bring this file up in the editor and change the "Swath" in the P51 command from 6 to either 3 or 4, save the file as some new name and follow the procedure described above.