

Engineering Units Technical Note

The MadgeTech Data Logging System allows users to create Engineering Units to receive output signals from a variety of sensors and have this information expressed as other, more meaningful units of analysis.

Application:

Measure brake cylinder pressure on a train

Materials:

- MadgeTech Software
- MadgeTech Process Series Recorder, ±100mADC measurement range Pressure Transducer, 0-300 PSI, 4-20mA output, self-powered

In this setup, the application is to record the output signal of a pressure sensor attached to brake air-lines. As seen above, the pressure transducer used in this setup has a 4-20mA output signal and a 0-300 PSI measurement range. This signal is recorded by the MadgeTech Process Series Recorder, and stored in NVRAM as amperage measurements. Later, when this information is offloaded into the MadgeTech Software for analysis the amperage measurements can be converted into pressure measurements. Here is how it is done:



Fig 1. Once the amperage information from the MadgeTech Process Recorder is downloaded into the MadgeTech Software, click "View" then "Engineering Units".

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Fig 2. Once the Engineering Units window appears, the user can either manually program the "Recorder Units" and "Scaled Engineering Units" sections, or can use the "Engineering Units Wizard". In this application, then Engineering Units Wizard will be used.



Fig 3. This is the first window of the Engineering Units Window. A description of the Engineering Units Wizard is displayed. Click "Next" to start.



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Engineering	Units					
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Fig 4. This window asks the user to specify the "Recorder Unit Type" and the "Recorder Unit". This is where information about the Pressure Transducer used in this setup is specified. For reference, the pressure sensor used in this setup has a 0-300 PSI measurement range and a 4-20mA output.

Engine	ering Units Wizard	Save changes to thi	sunit	Cancel changes
	Engineering Units Wiz	ard		. 11-3
	Select your recorder units b First, select your recorder un directly measured your record Then, select your recorder u engineering unit on, such as	elow. it type from the upper list. Th ider, such as voltage or curre unit from the lower list. This is a millivolts or milliamps.	is is the type of signal tha nt. the actual unit you will ba	can be
ngineering Jnit ID	Select the type of unit Recorder Unit Type: Select the recorder un Recorder Unit:	s that are directly measu elect a Recorder Unit Type Select a Recorder Unit Type Voltage Eurent General Potential	ared by your recorder:	n: val uni
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Fig 5. Here the user is specifying "Current" because the output signal of the pressure transducer is in mA (current).

Fig 6. Here the user is specifying "Milliamps (mA)" because the pressure transducer has a 4-20 mA output signal. Once these values are specified click the "Next" button.

👍 Engin Engineering Units ring Units Wizard Engineering Units Wizar Engir Units Select your recorder units below ID 💌 First, select your recorder unit type from the upper list. This is the type of signal that can be directly measured your recorder, such as volkage or current. Then, select your recorder unit from the lower list. This is the actual unit you will base your new engineering unit on, such as millivolts or milliamps. Select the type of units that are directly measured by your recorder: rder Unit Type: Current -Select the recorder units you will base your new engineering units on Recorder Unit: Milliamps (mA) • all units [Enginee elect a Recorder Unit Unit ID Ur nps (A) s (mA) Microamps (µ Help <Back Next> Cancel Help. ОК



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Fig 7. In this window the user programs the "Scaled Engineering Units", which allow the amperages units shown in Fig 1, to be expressed as "Pressure" with a label of "PSI" indicating that pressure shall be expressed, and the Label is PSI indicating the data is pounds per square inch. Click "Next" to continue.

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Engine	Engineering Units	Wizard	changes to this	unit I		ancel channe;	<u> </u>
	Enter your unit scale p Most sensors will hav input. For example, a 0-100 PSIA.	coints in the boxes b e clearly marked out current output press	elow. put scales relatin ure transducer n	ng the outpu nay output 4	t signal to the r 20 mA for an ir	neasured nput of	9 Uni 1
	Enter the high an Unit	d low scale point Milliamps (mA)	ts for your en	jineering (-> Press	units: Ire (PSI)		1
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nit ID	Calculated Offset:	0	Cak	ulated Gain	1		
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Fig 8. This window is where the user will enter the values of the external transducer including the "Low Scale Point" which is the low range of the pressure transducer output (i.e. 4), and the "High Scale Point" which is the high range of the pressure transducer output (i.e. 20). Once these are entered, the user will specify the range of the pressure transducer by entering the low range of the pressure transducer (i.e. 0) into the text box adjacent to the "Low Scale Point" under the "Pressure (PSI)" column and then enter the high range of the pressure transducer (i.e. 300) into the text box adjacent to the "High Scale Point" under the "Pressure transducer (i.e. 300) into the text box adjacent to the "High Scale Point" under the "Pressure (PSI)" column.



Fig 9. This window shows the entered values from Fig 8, and also displays how the MadgeTech software has automatically created a "Calculated Offset" and "Calculated Gain". Click "Next" to continue.



🖾 Engineering Units	×
Engineering Units	
Engineering Units Wizard Save changes to this unit Cancel changes	
Engineering Units Wizard	11.35
The settings below are optional, so you may leave them at the default or select your preferred settings.	tID 💌
The unit ID is a number that is associated with the unit in your computer. If you are setting up a recorder to use these engineering units the ID is what is toted in the recorder to allow the units to be automatically displayed. If the units associated with an ID change alter the recorder is launched, the downloaded data will no konger be displayed in the original, intended units.	=
If you would like to choose a particular ID for this engineering unit, select it from the list below:	-1
Unit ID: Use Next Available Unit ID Check the box below to make these engineering units available whenever you use the software:	all units 🔽
Unit ID	Ur
Help Cancel <back enrich<="" th=""><th></th></back>	
	>
Help	ок

Fig 10. This window allows the user to program a "Unit ID" for the engineering unit that is being created. Click the "Next" button to continue.

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Engineering	Units		
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	Engineering Units Wizard		11-3-
	You have entered all the information necessary If any of the information is incorrect, you may us Please review the summary information create your new engineering unit.	to create your new engineering units. e the 'Back' button to make changes. below, and press the 'Finish' button to	J Units
	Definition Graph	Summary	
Engineering Unit ID 0	300 Pressure (PSI) 0 4 20 Milliamps (mA)	Recorder unit type: Current Recorder unit Milliamps (mA) Engineering unit: Pressure (PSI) Low scale point: 4 > 0 High scale point: 20 > 300 Unit ID: Next Available ID Save unit on close: Yes	• all units 「 Ur 0
<	Help Cancel	< Back Next> Einish	
Help	·		ОК

Fig 11. The final step of the "Engineering Units Wizard" summarizes the information that was entered and displays a "Definition Graph", which is how the information will be graphically represented and analyzed. Click the "Finish" button and then "OK" as the final confirmation.





Fig 12. The user is returned to the "Engineering Units" window. Notice how the new engineering unit is now shown under the "Engineering Units List" as Unit ID 0. Click "OK" to close the engineering units window.

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Fig 13. Back in the software, with the amperage data displayed from the Process101 current recorder, select any data point with the left mouse button and right click to bring up the context menu. When the menu appears, click "Select Graph Units" and choose the engineering unit that you would like to use. In this case, the application is measure brake air-line pressure, so a Pressure engineering unit was created. Click "Pressure (PSI)".





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Fig 14. The data that has been recorded using the MadgeTech Process Series current recorder connected to an external pressure sensor can now be analyzed and manipulated as units of pressure.

The engineering units function is simple and easy to use. The user only needs to program the units that are being recorded, and then program how they shall be expressed.

This completes the illustrated Engineering Units Technical Note.

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