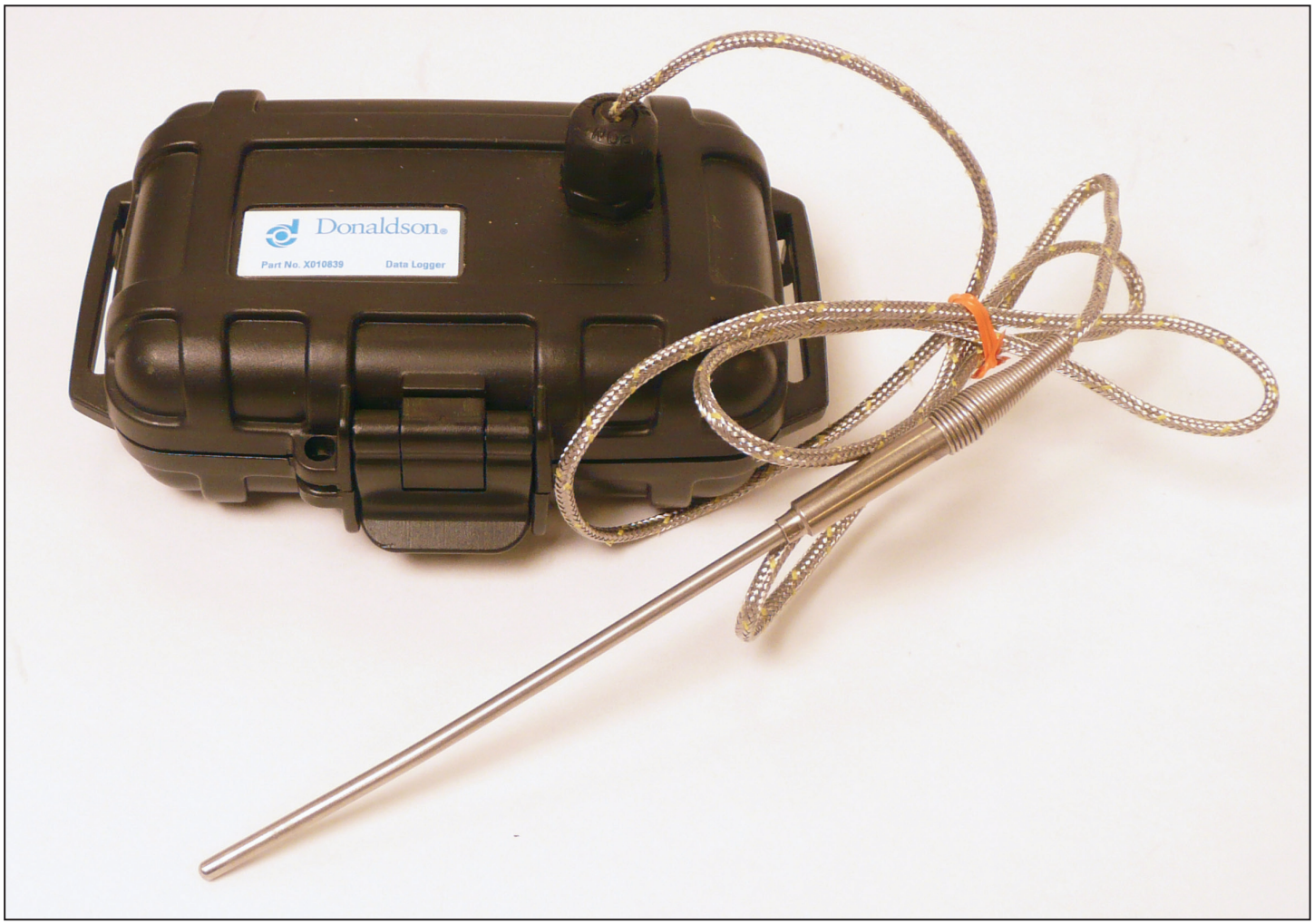
OWNER'S MANUAL

Installation, Operation, and Maintenance Information

Retrofit Emissions
Exhaust Gas Temperature Data Logger

Manual No. P480348 Rev 2



This manual is property of the owner. Leave with the unit when installation and start-up are complete. Donaldson Company reserves the right to change design and specifications without prior notice.

Do not make any system modifications or adjustments that would alter the original retrofit installation. Modifications may not meet California ARB Executive Order requirements, be considered illegal devices and may result in denial of warranty coverage.

Consult your Donaldson certified emissions dealer if you have questions regarding the installation, operation, maintenance or warranty.

Illustrations are for reference only as actual product may vary.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

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Introduction

It is important to understand the exhaust temperature profile before applying passive filter-based emissions control devices, including the Donaldson LNF and LXF technologies. Insufficient exhaust temperatures may prevent filter regeneration of trapped soot and not convert it into ash. This failure can lead to premature filter plugging and increased maintenance to keep the filter operational while the engine is running. "Data-logging" is a process used to take a snapshot of the duty cycle of a specific diesel engine. This resulting profile is then used to ensure that the engine is generating the proper heat necessary for a proposed filter based product.

A data logger is a device used to record the exhaust temperature during engine operation. Donaldson has chosen the Madgetech Data logger as the preferred supplier of data loggers. However, engineering can find other brands and methods acceptable. In general, the data logging tool records several days of information to provide a required data sample size by State or Federal regulations. Since engine duty cycles and resulting exhaust temperatures are influenced by factors such as speed, load, idling, geography, ambient temperatures, and driving tendencies, the vehicle must operate under its "normal operating conditions" so that an accurate picture of the exhaust temperature profile is obtained.

This document identifies general data logging requirements for Donaldson's filter based emissions devices. Data logging procedures and guidelines may vary depending on regulatory agencies or purchasing authorities in your area. If in any case where the data logging requirements outlined in this document and the program conflict, the regulatory requirements will take precedence.

Features

- New and improved; Designed specifically for exhaust profiling
- Holds up to 30 days of data (@ 5 sec. intervals)
- Meets new California data logging requirements
- Moisture resistant durable plastic case
- Flexible sample interval allows for 1 second to 12 hour data collection rate (5 sec. required)
- 500,000+ data point memory

Package Content Kit

X010839

Data Logger Contents

- 1/8" NPT Half Coupling (P226616)
- 1/8" NPT Compression Fitting (P227812)
- Thermocouple (P228220)

Other items needed for data logging:

- Computer with Microsoft Windows operating system (2003 or newer required)
- - Software: software available from web at www.madgetech.com/software-download

  - PC interface cable: Item X007948 linkup tool
- Donaldson Profile Form obtained by emailing emissions@donaldson.com
- Donaldson Preassessment form (F114050)
- **Band clamp**

Pipe Outer Diameter	Part Number
3.0"	J000200
3.5"	J000201
4.0"	J000202

- Zip ties
- Anti-Seize
- Replacement battery: 3.6 Volt, Lithium Battery, 350 mAH (available from www.madgetech.com, P/N: LTC-7PN)

Steps for Data Logging

1. Assess Vehicle or Fleet

For exhaust temperature data logging purposes, the engines within a fleet of vehicles considered within a bid must be divided into subgroups of similar engines.

Each subgroup must be organized to contain engines that have the following in common:

1. Same engine manufacturer (i.e. same make)
2. Same engine model
3. Same particulate matter (PM) standard
4. Same rated horsepower (within ± 50 horsepower)
5. Same description for engine NOx control system (one of the following)
    a. None of the engines have any type of exhaust gas recirculation (EGR)
    b. All engines have external EGR
    c. All engines have internal EGR
6. Same vehicle type (e.g. school bus, refuse bus, dump truck, etc.)

2. Data Logging Guidelines

1. At least 5 vehicles or 10% within each subgroup must be data-logged, whichever is larger. All vehicles/ engines within a subgroup of five or fewer must be data-logged.
2. The exhaust gas temperature data recorded requires a minimum of 24 hours of operation. (@ 5 sec. intervals)
3. The vehicles chosen to represent a subgroup for data logging should be those considered to have the coldest operating duty-cycle with regard to exhaust temperature.
4. 100% of on-road diesel engines must be data logged for consideration of applying a Donaldson filter-based retrofit emission control device.

Complete Retrofit Emissions System Design Profile Form

The Retrofit Emissions System Design Profile Form is a MS-Excel form developed by Donaldson to collect information about a vehicle/ engine. This form ensures engine and technology compliance with EPA/California regulations and product verifications. The Donaldson Profile Form is how Donaldson classifies each vehicle that is logged and recommends technology for the desired application.

Donaldson asks that this profile form is completed prior to the Data logging process to ensure the vehicle/ engine is included in the EPA and California Air Resource Board (CARB) regulations.

Donaldson
FILTRATION SOLUTIONS

Retrofit Emissions Systems Design Information Profile
V2.3

In order to deliver the optimum emissions retrofit system for your engine, Donaldson Product Management/Engineering require details on the equipment you want to retrofit. Please fill out sections 1-4 and email the document to Donaldson Retrofit Engineering at emissions@donaldson.com.

Section One	**Distributor Information**					
	Distributor Name					
	Address					
	City		State		Zip	
	Contact Name		Phone #			
	Fax #		Email			
Section Two	**Customer Information**					
	Company/Customer					
	Address					
	City		State		Zip	
	Total # Vehicles in Fleet		Total w/ Same Specifications			
Section Three	**Vehicle Information**					
	Vehicle Type		Year			
	Vehicle Manufacturer		Vin #			
	Model		Vehicle #			
	Comments/Other					
Section Four	**Engine Information**					
	Manufacturer		Turbocharged			
	Series/Model		Engine Family #			
	Year		Exhaust Flow (Rated Power)			
	Displacement (liters)		Miles on Engine			
	Rated RPM		Date of Last Engine Rebuild			
	Rated Power (hp)					
	Comments/Other					

Tips for filling out the Profile Form:

- Fill in all information available. Lack of information could delay data from being processed.
- Use macro's buttons and pull down menus where available.
- Enter text into blank fields only; do not modify any cells containing test or drop down in blank fields.
- One form is required for each vehicle that is logged.

3. Data Logger Installation

The installation of the data logger involves the following steps:

A. Data logger Software Install and Data Recording Set-up.

B. Data logger installation on selected vehicles/engine.

C. Operate the vehicle under normal operating conditions.

D. Data logger Processing Instructions.

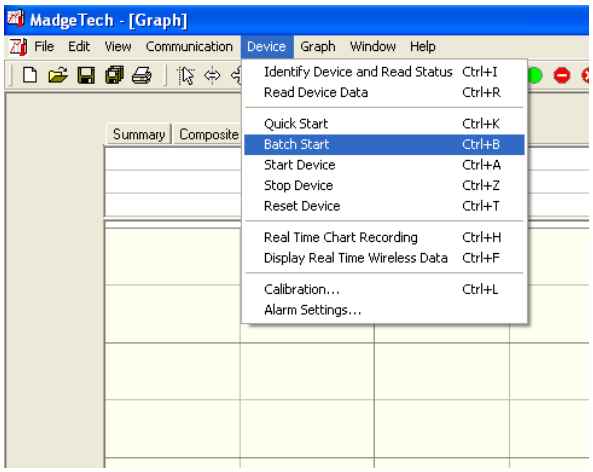
E. Records.

A.) Data Logger Software Install and Data Recording Set-up

Before mounting the data logger case on the vehicle, install the software and set the dates for recording data. The collected data will be used to determine the appropriate or desired technology for each application.

How to Program a Mototron Data Logger

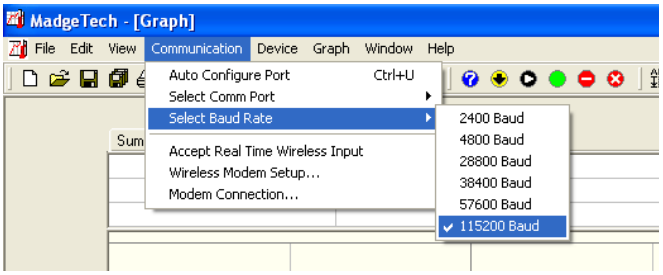
1. Verify that you have the most up-to-date software from Madgetech. Please visit the Madgetech website to update your software.
2. Open up the Madgetech Software.
3. Select "Device" and then "Batch Start" to start pre-programming your loggers.



a. If you encounter errors, please check to make sure your baud rate selected in the software matches the baud rate on the device (found above the device serial number).

b. Communication > Select Band Rate:

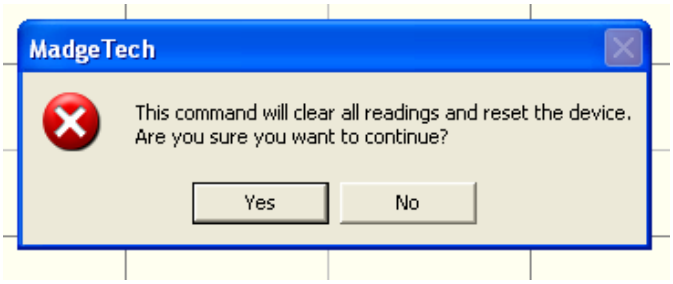
- TC101A = 115,200
- TC110-2MB = 57,600



c. If you continue to get errors, please check the battery. It may need to be replaced.

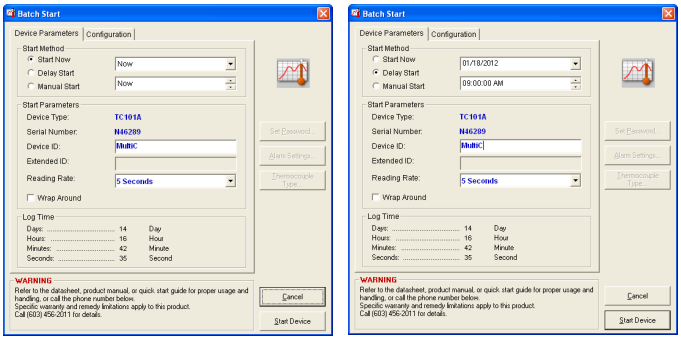
Software can be downloaded from Madgetech.com/software-download.

4. A screen will prompt you that by pre-programming this logger, you will be erasing all the previous data captured on the logger. Select "Yes".

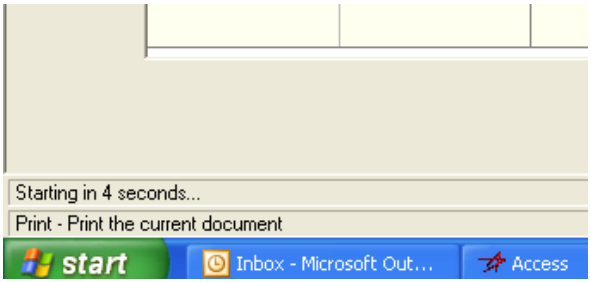


5. If your logger is in need of calibration, this screen will pop up. Please click "OK". Contact Madgetech directly to get the device calibrated. The calibration surrounds the internal temperature recording device and the date/time stamp.

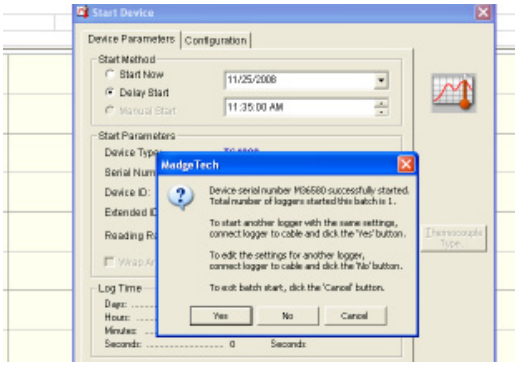
6. Then you come to a start screen. Select "Batch Start" on the left hand side and then select the date and time you wish to start your logger. BEFORE clicking "Start", verify that the time interval for sampling is set at 5 seconds. Once everything is verified, please click "Start".



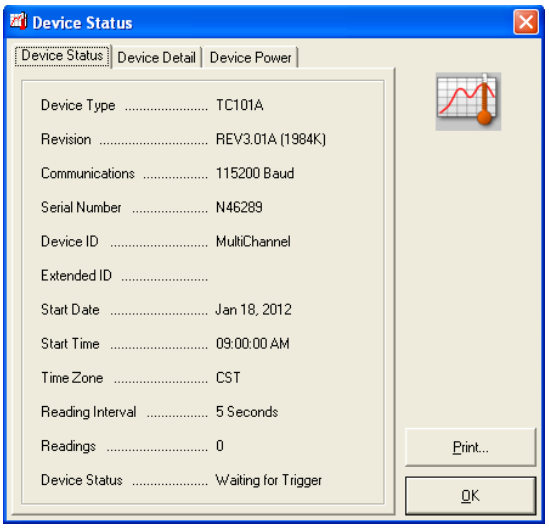
7. After clicking "Start", you should get communication signals on the bottom, left hand side of your display screen. See the picture below for reference.



8. Once the logger is programmed, a screen will prompt your to either re-program more units to the same date and time or to quit the programming sequence and start at the main screen. Please follow the screen's directions appropriately.



9. After completing the programming of the logger, verify the logger has taken the settings. Select the following icon and verify your settings are correct.



10. If you have any other questions or concerns about data logging, please contact Donaldson Technical Service at 866-817-8733 or emissions@donaldson.com.

B.) Data Logger Installation on Selected Vehicle/ Engine

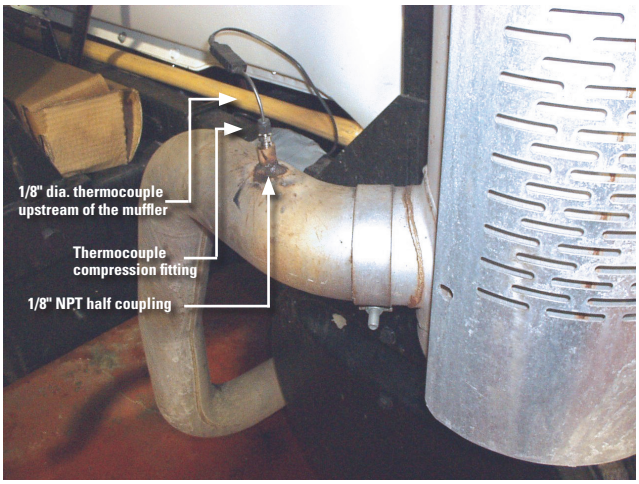
The data loggers are battery powered and will require no wiring. Below are the instructions to mount, dismount, and plug exhaust tap.

1. Find an area no more than 6" upstream from the inlet of the existing muffler or in front of retrofit location.
2. Drill a 9/64" hole in the exhaust pipe.
3. Weld the P226616 1/8" coupling to exhaust pipe* or make a reusable band clamp to secure the coupling to the exhaust line.

   Verify that the directional threads on the coupling in the proper orientation for the thread fitting.
4. Open the data logger box and remove the P227812 fitting.
5. Apply small amount of anti-seize onto threads of fitting.
6. Thread fitting onto the welded bung until snug.
7. Push the thermocouple probe through the fitting as shown and tighten pinch nut.
   a. If using Accuseal clamp, undo accuseal nut and fit around exhaust pipe
   b. Be sure to line up previously drilled hole with the welded fitting on the clamp

c. Tighten down the clamp and be sure the hose still lines up; the clamp tends to shift during tightening.

8. Route thermocouple cable away from hot surfaces with zip-ties and secure data logger with 2 or three zip ties to frame rail.



C.) Operate Vehicle in Normal Operating Conditions

- CARB regulations: 24 engine operating hours

D.) Data Logger Processing Instructions

- After confirming the vehicle has accrued 24+ hours of operation, upload the data by using the X007948 cable Madgetech software and DCI Profile form.

After the data collection is completed on the vehicle, it is essential to handle the data and vehicle information properly in order to obtain a prompt response from Donaldson Engineering regarding the appropriate emissions technology. Donaldson processes and files each vehicle characteristic that is logged to provide record for future purposes.

Use the following instructions carefully to ensure proper storage and processing of the data.

Requirements:

- Microsoft Excel 2007 or newer (MACROS enabled)
- A Donaldson Data Logger (5 second sampling, 24hrs + runtime data)
- MadgeTech Software and link-up tool (IFC110 or IFC200)

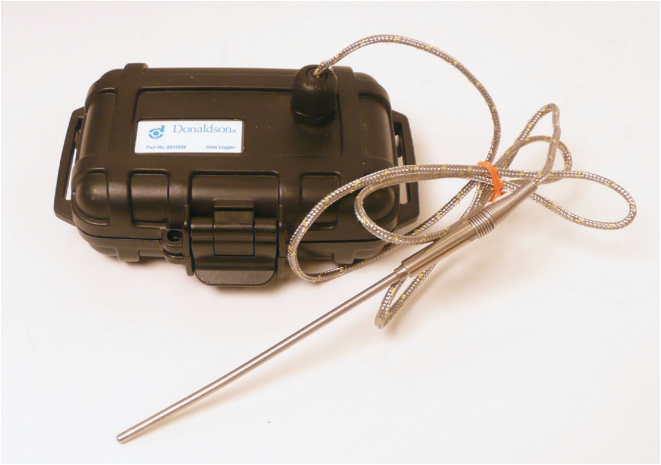
1. DCI Profile Form

The DCI Profile Form is how Donaldson classifies each vehicle that is logged. This information is used to generate recommendation letters for tailpipe product specific to each vehicle that is logged. Completion of this form is required when purchasing product from the Donaldson Company, Inc. The electronic form has specific "drop-down" menus for easy use and data entry.

- Complete all data fields
- Use the macro buttons and pull down menus where available.

- Enter text into blank fields only; do not enter data into any cells already containing text or attempt to alter the drop down menus.
- One completed form is required for each vehicle that is logged.

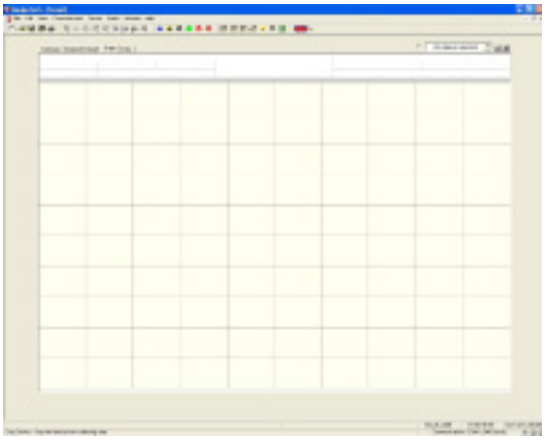
2. Retrieve Data logger from Vehicle



Remove all components from the vehicle after logging 24+hrs of runtime data

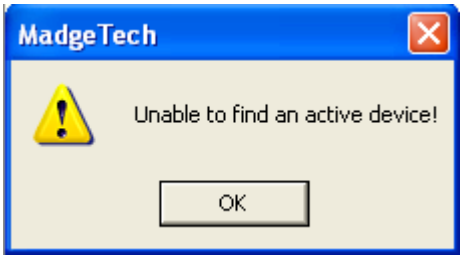
1. Loosen AccuSeal clamp nut and carefully pull out entire probe/ fitting/clamp assembly.
2. Cut all mounting zip-tys and remove data logger box.
3. Thread a sheet metal screw, a pop rivet or weld a bead into drilled hole or fitting on exhaust pipe to prevent an exhaust leak.
    a) Keep in mind that you may want to use the hole created for the temperature probe as the port for the backpressure monitor system.

3. Data Extraction from Logger

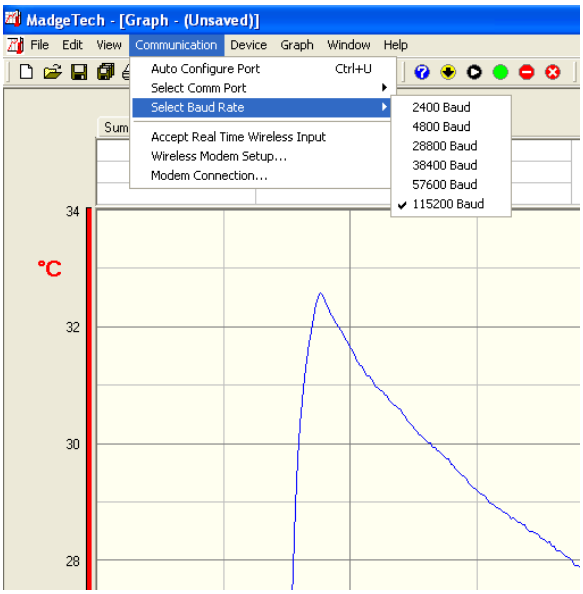


- Open the logger box and connect via link cable to your PC containing Madgetech software.
- Open the Madgetech software, use the shortcut if available. A shortcut icon should be on your computer's desktop after installation.
- A blank data sheet should open and look similar to the picture on the above.

- If the logger is not connected to the computer properly you will get this error message.



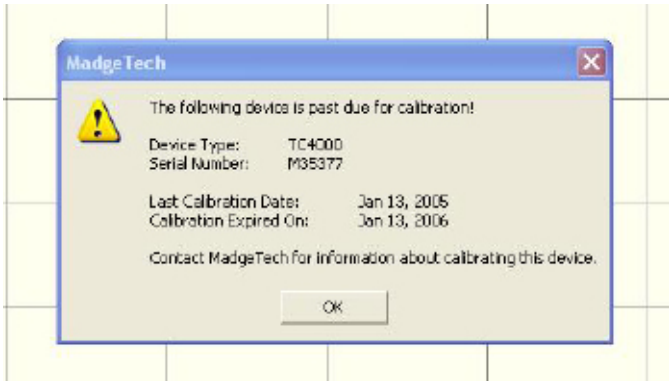
- If the logger is properly connected but has a dead battery you will get this type of error message.
- If you have the incorrect baud rate selected you will get this type of error.



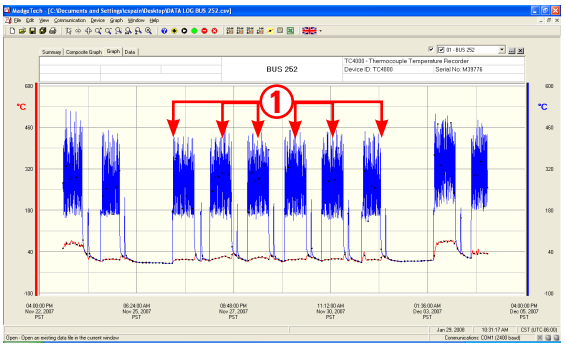
- The proper baud rate must be selected for the data logger in MadgeTech. For a TC110A the proper baud rate is 115,200. This information should be listed on the data logger label.

4. Import the Data from the Logger Box onto the Computer

- Click on the yellow circle with a down arrow to start importing the data.

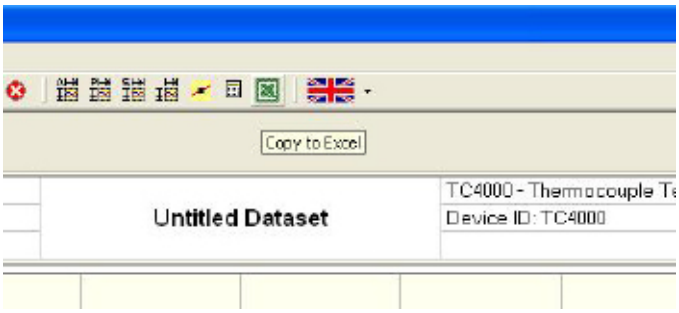


- Verify the serial number matches the number on your data logger and press "ok".
- The data should then populate the blank graph screen.
- This will take several minutes as there are several thousand data points to import.
  a. Monitor the bottom left corner of the data sheet to verify that your logger is sending the data to the computer.

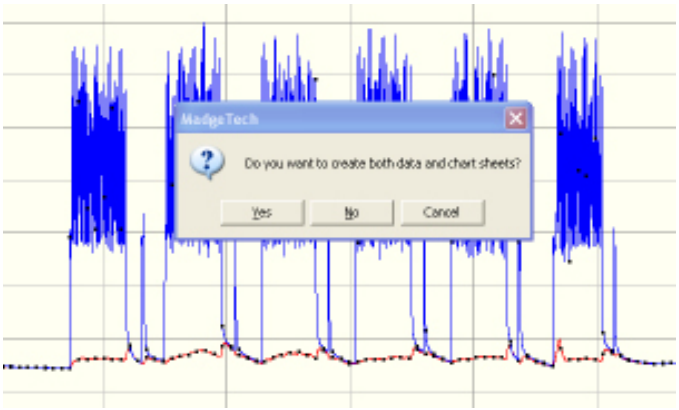


- Verify that there is typical exhaust profile captured during the run time.
  a. There should be distinct periods of "on time"[1].
  b. If the data is "flat" with no significant increase or decrease in temperature, there are three reasons as to why the logger didn't capture the exhaust temperature.
     i. The vehicle did not run during the logging period
     ii. The logger was installed incorrectly or not at all
     iii. The logger is malfunctioning and a simple functionality test is required.

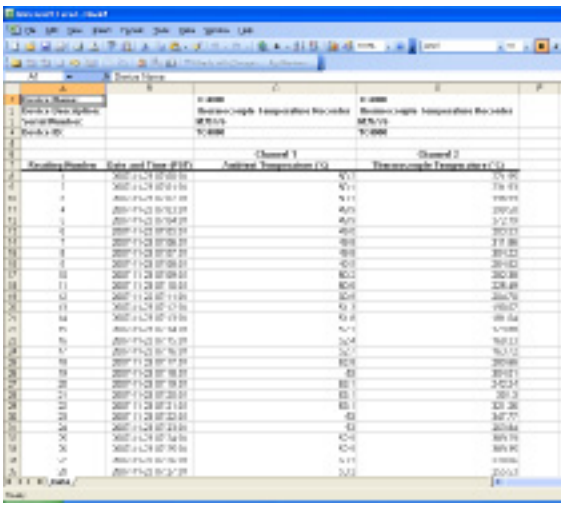
5. Import Data into Microsoft Excel



- In order to copy the data into a Microsoft Excel spreadsheet, please use the import tool located on the tool bar
- DO NOT use the "Save As" command, this will save the file in an unusable format.

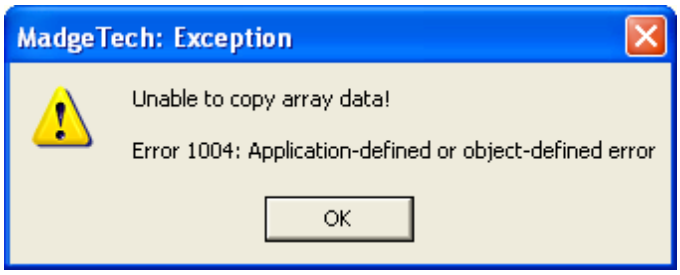


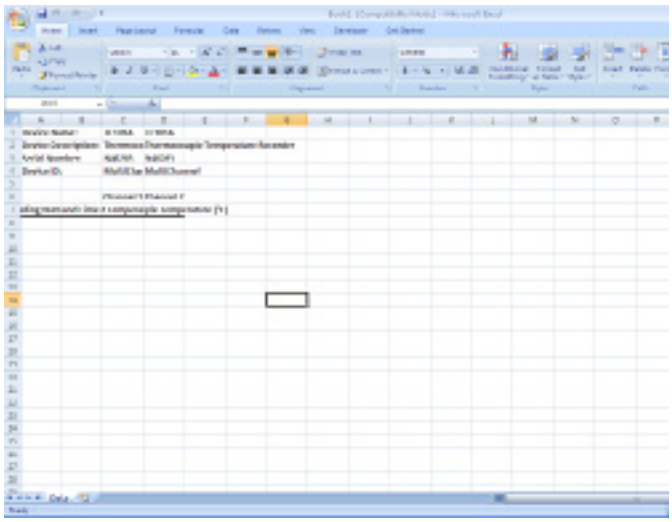
- Click "no" to create a data sheet only.



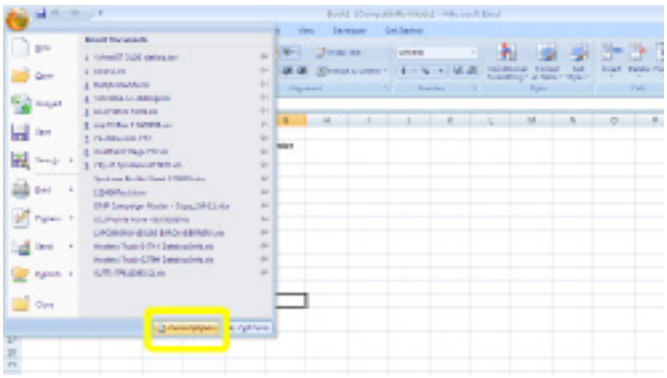
- Microsoft Excel will open and data will automatically populate one sheet titled "Data."
- If you receive any errors, proceed to the next section for troubleshooting.
- Save the file to your desktop as "Bus_###". Fill in the appropriate bus number that you are processing. Then close the file.

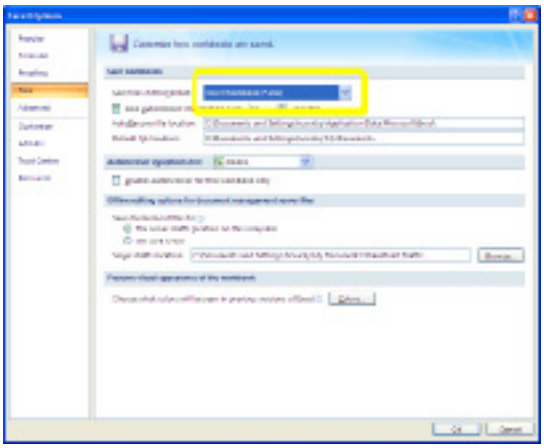
6. Possible Issues During Export to Excel





- Due to the new datalogging regulations, Excel version 2007 or newer must be used in order to handle the larger data files. If you are attempting to use an older version of Excel or Excel 2007 is not setup properly you will get this error when you press the "Copy to Excel" button in MadgeTech.
- Then Excel will open and only display the header.
- To have Excel 2007 import the larger data files, select "Excel Options" on the pull-down menu.

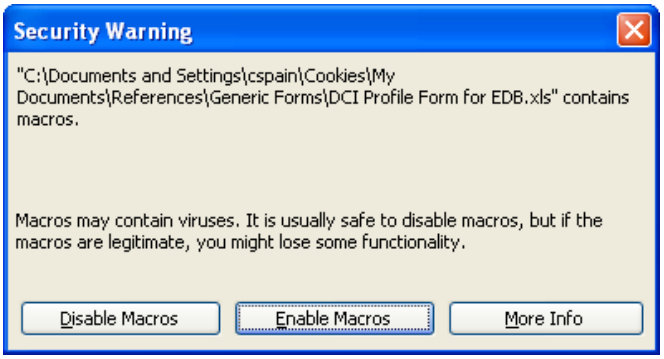




- The last step is to select the "Save" tab on the left and change the file format to .xlsx and press OK. MadgeTech will now export the full data file to Excel. Follow the steps in section 5 to export the file to Excel.

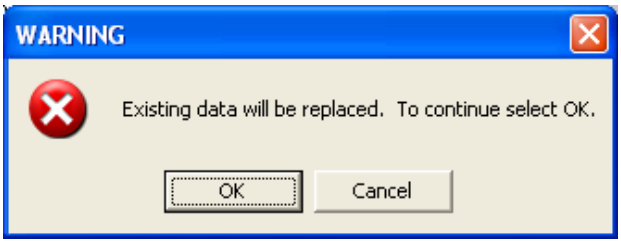
7. Import the data onto the Donaldson Profile Sheet

- Open the saved profile sheet on the vehicle you just took the data logger off of.

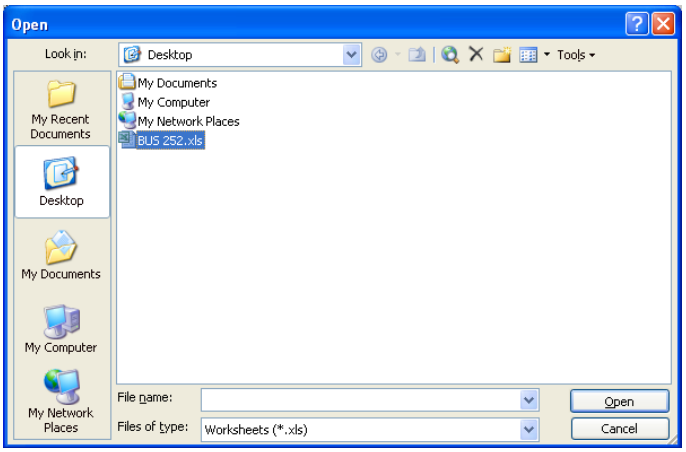


- You could get this warning. "Enable" the macros as you will be using them to import the data into the form.

- Once your profile is open, click on "Import Temp Data".



- A warning screen will pop up prompting you that any temperature data already saved will be erased. Click "OK".



- When you click "OK," this screen will pop up and you will have to select the previously saved spreadsheet with chart and data files. It should be located on your desktop. Highlight the appropriate file and press "Open".
- A confirmation screen will pop up confirming the data has been imported into the new profile sheet.

- To confirm, verify that a second tab has been added to your spreadsheet. It should be labeled "Bus_###", where ### is the vehicle number that was data logged.

- Click on the tab to verify that the data was imported.
- Save the entire excel file onto your desktop as "Customer Name_Vehicle #".

8. Send Data File to Donaldson for Review

- Send the completed profile form (info sheet and data) to emissions@donaldson.com.

E.) Records

Histogram and recommendation letter:

- After review, engineering will respond within 1-2 business days with a recommendation letter and histogram.
- Recommendation letters and histograms are required to be on file for future use. DO NOT DISPOSE!

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