



renovelo
byterlogger



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Terminology and Acronyms

CEL – Check Engine Light: This is the light on the instrument cluster which is illuminated if serious faults have been detected with the engine.

DAQ – Data Acquisition: This is a process where engine parameters and voltages are recorded for later analysis.

DME – Digital Motor Electronics: This is BMW's acronym for the computer which controls all aspects of the engine's operation.

DTC – Diagnostic Trouble Code: These are the error codes which are stored within the DME when faults are detected. If the faults are serious enough, the user is alerted through the check engine light (CEL).

ECU – Electronic Control Unit: This is a generic acronym used for any type of automotive computer.

MAF – Mass Air Flow: This is referring to the sensor which measures the exact air mass coming into the engine.

VANOS – VArable NOckenwellenSteuerung: This is BMW's acronym for variable camshaft timing. During the model refresh of the E36 3-series and the E34 5-series, BMW introduced this technology into new engines which allows for phasing of the intake camshaft, significantly improving torque at low engine speeds.

Introduction.



What is ByteLogger

ByteLogger is our first tool compatible with BMW OBD2 vehicles. In our quest to provide customers with a suite of DME tuning tools, this is the first step. This software will allow you to:

- Diagnose primary & shadow engine DTCs
- Read sensor 'freeze frame' values when a DTC was set
- Clear all DTCs
- Read detailed DME info
- Display live engine values
- View saved data log files
- Perform live data logging
- Perform analog data acquisition from aftermarket sensors ¹

¹ Additional DAQ hardware must be purchased for this capability.

System Requirements

ByteLogger has been developed to work with Microsoft Windows® 7, 8, and 10. It has not been intended for use on any other operating system.

Minimum

- 1GHz CPU
- 512MB RAM
- Microsoft Windows® 7/8/10
- Microsoft .NET Framework 4.6.1
- USB 1.0
- USB OBD2 diagnostic cable

Recommended

- 2GHz CPU
- 1GB RAM
- Microsoft Windows® 7/8/10
- Microsoft .NET Framework 4.6.1
- USB 2.0 or newer
- USB OBD2 diagnostic cable
- DATAQ analog DAQ (DI-1100) ²

² Only required if performing analog data acquisition (purchased separately from DATAQ)

Customer Support & Troubleshooting

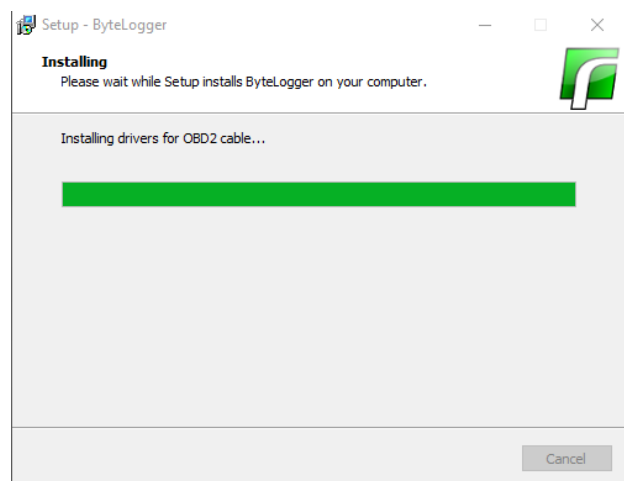
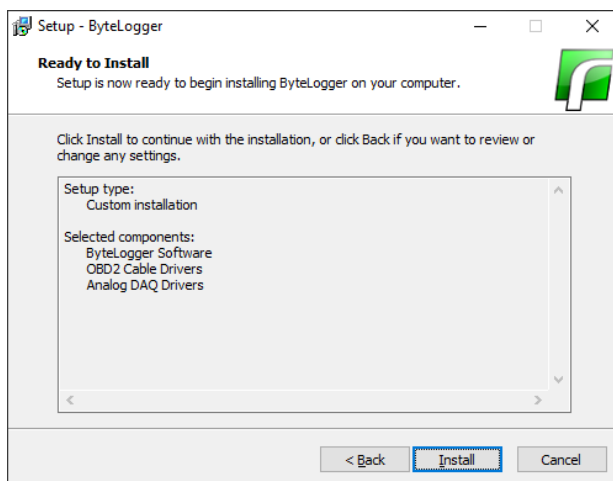
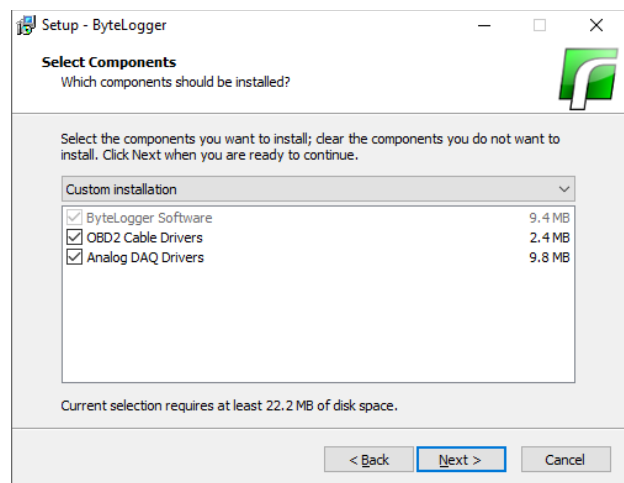
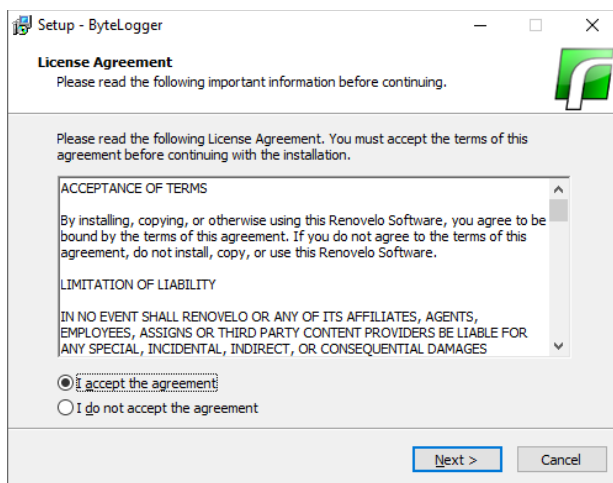
Should you encounter any problems with our ByteLogger software, contact a representative at Renovelo using our website (<http://www.renovelo.com/contact-us>). Another option is to browse our support forums which can also be found online (<http://www.renovelo.com/forum>). The support forum might get your issue resolved faster, especially if the issue you're facing has already been addressed by someone else.

Installation.

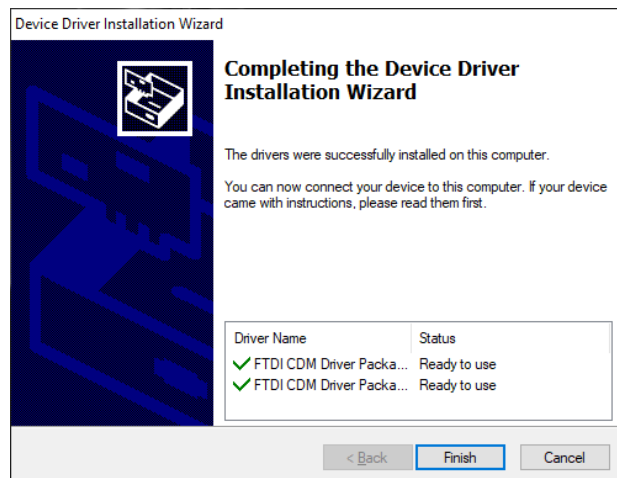
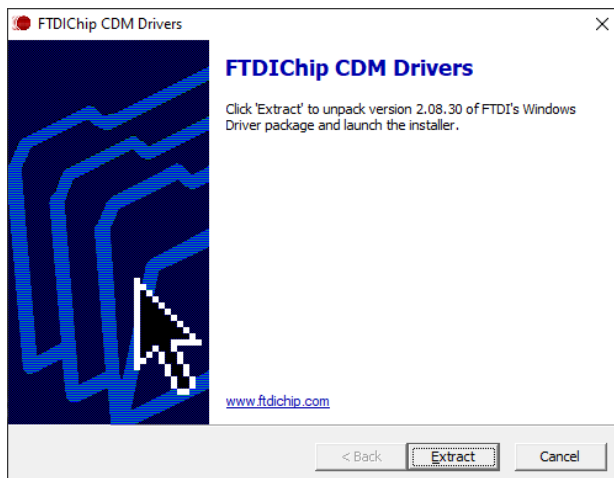
Installing ByteLogger

***** Important: Do not plug the diagnostic cable into your computer until all software and drivers have been successfully installed! *****

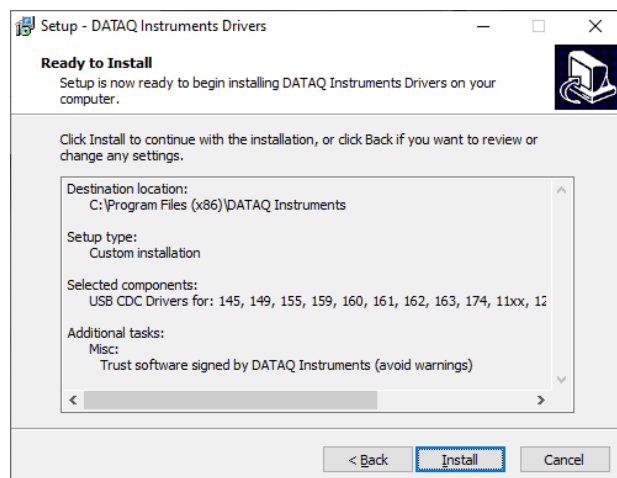
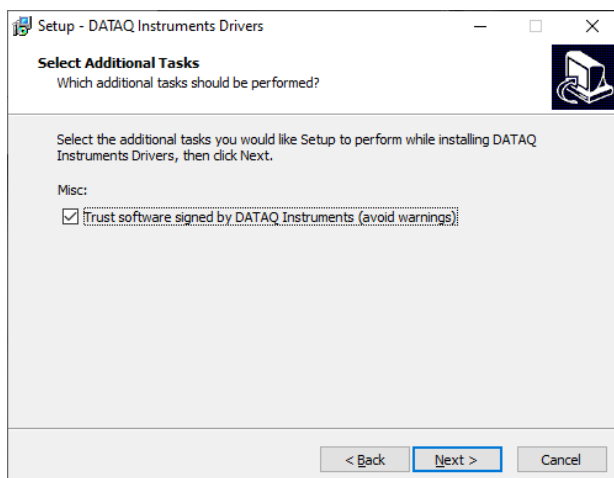
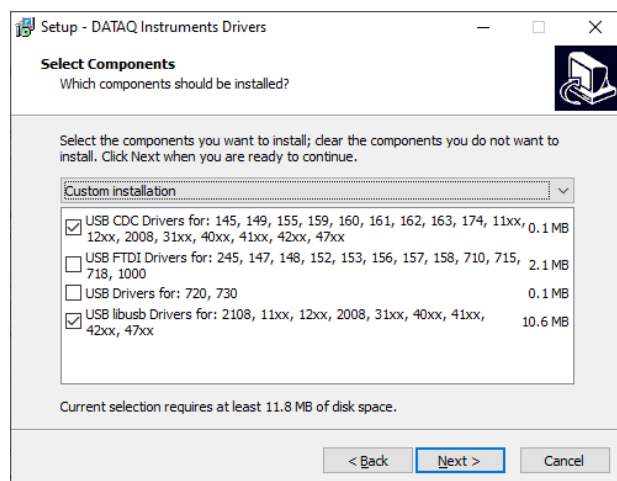
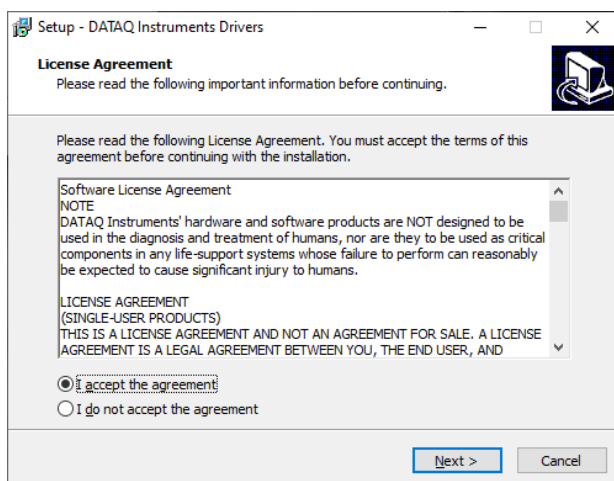
After downloading ByteLogger, launch the installer and follow the prompts as shown below.

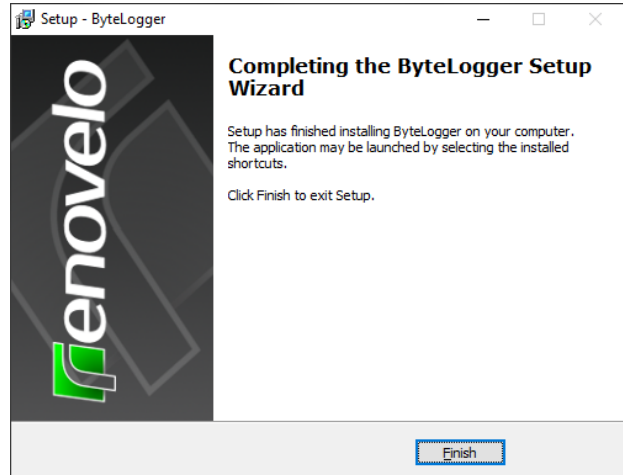
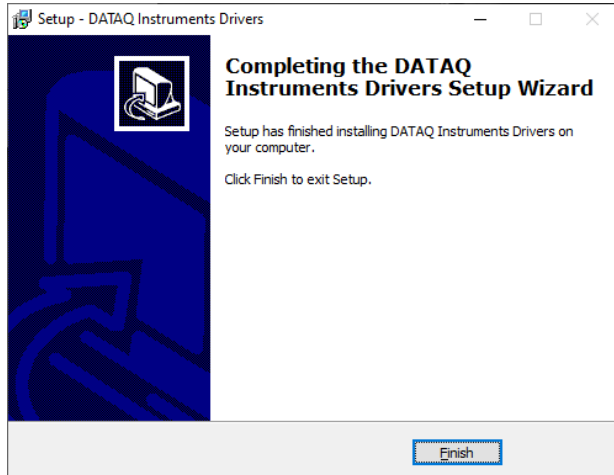


After the main program files have been installed, the appropriate drivers from FTDI will be installed for the diagnostic cable. Accept the default settings for these prompts as well. Some of these dialogs are shown below.



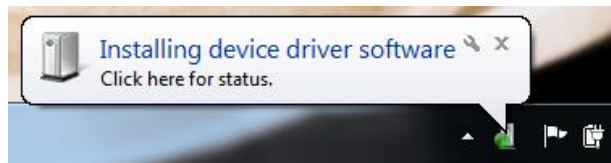
The next images below show the DATAQ driver installation. **On the second dialog box only the drivers for the DI-11xx are being installed instead of drivers for all DATAQ products.** Choosing these two options will minimize the hard drive space required for the installation. Otherwise, the default values can be accepted for all other dialog windows.



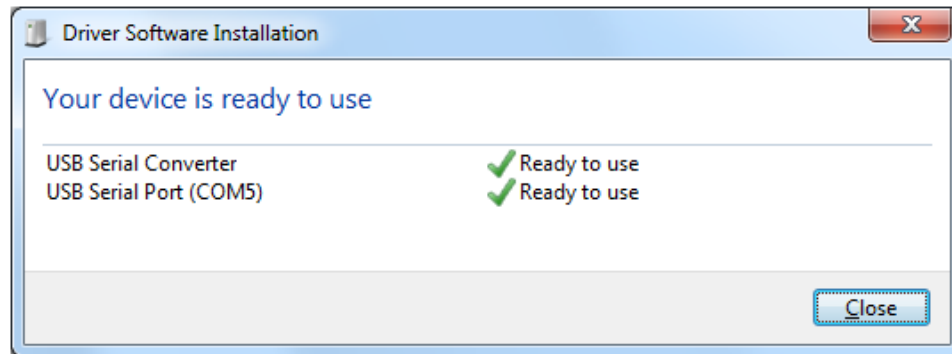


To ensure that Windows does not try to overwrite the drivers that were just installed, disconnect your computer from any wired or wireless internet source.

Next, plug the OBD2 diagnostic cable into your computer and Windows will finish installing the drivers. A small window might appear alerting you of this as shown below.



Almost immediately after this, Windows should find the drivers that were just installed and the window below might appear. Although COM5 is the port shown below, your results may vary.



Next, changes need to be made to the default settings for the diagnostic cable. Follow the steps below to open the *Device Manager* depending on which version of Windows you're using.

Windows 7

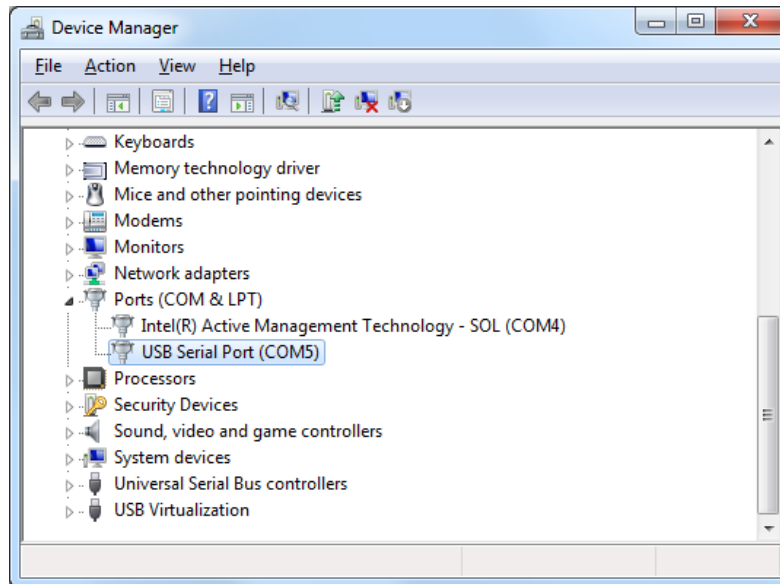
Open *Device Manager* by clicking the *Start* button, clicking *Control Panel*, clicking *System and Security*, and then, under *System*, clicking *Device Manager*. If you're prompted for an administrator password or confirmation, type the password or provide confirmation.

Windows 8

1. Swipe in from the right edge of the screen, and then tap *Search*. (If you're using a mouse, point to the lower-right corner of the screen, move the mouse pointer up, and then click *Search*.)
2. Enter *Device Manager* in the search box, and tap or click *Device Manager*. You might be asked for an admin password or to confirm your choice.

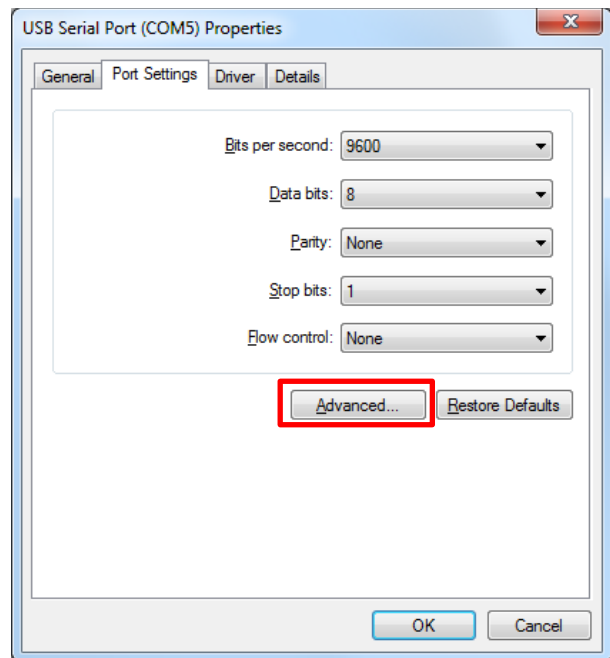
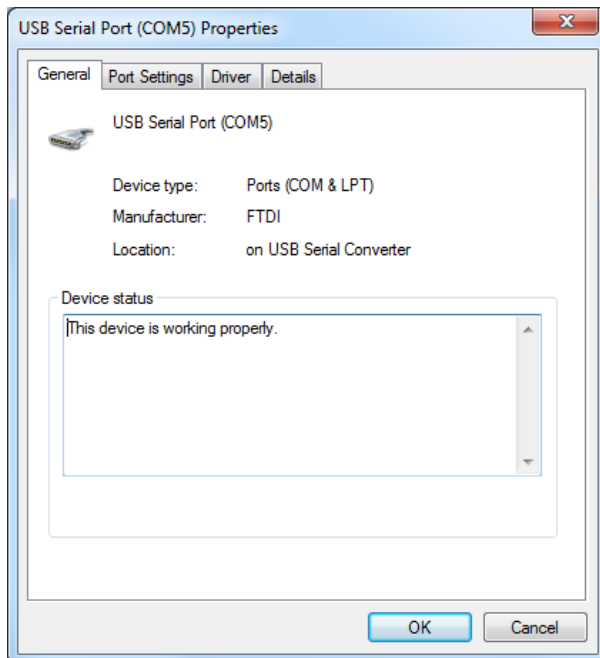
Windows 10

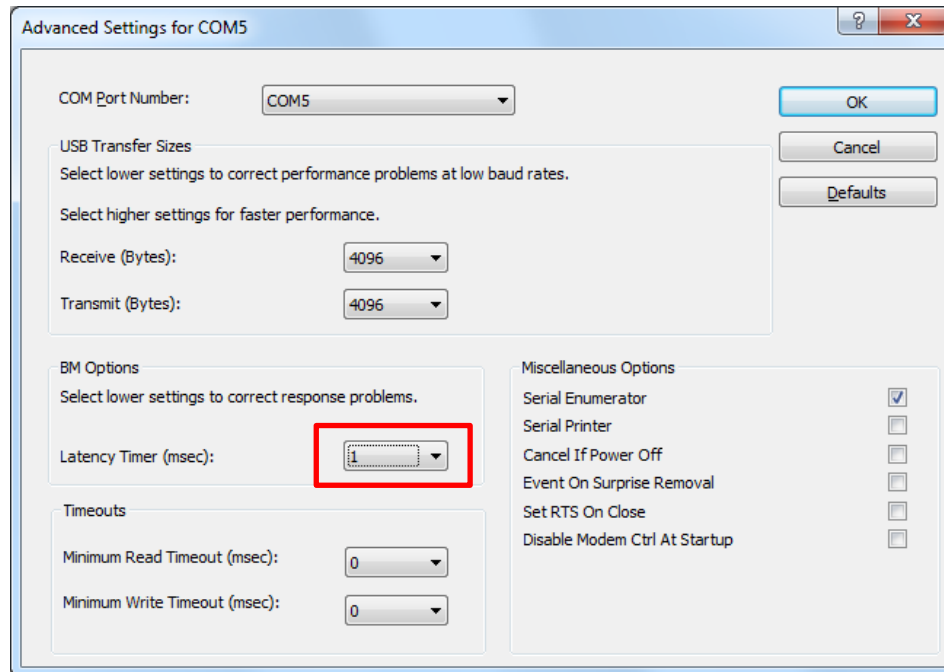
Click the *Start* button, start typing "Device Manager", then click *Device Manager*.



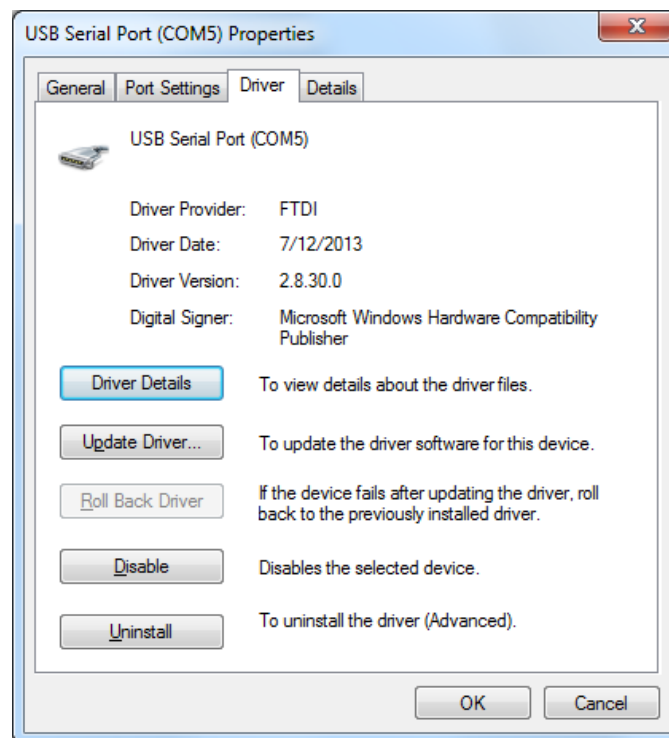
Open the group called *Ports (COM & LPT)* as shown above by clicking on the small arrow to the left of the title. Notice that the diagnostic cable appears as COM5. Again, your results could vary and may not show the same port. To verify which port your cable is connected to, it may be necessary to unplug the cable, see which COM port disappears from the list, and plug the cable back in again.

Once the correct COM port has been identified, right click on it and then choose *Properties*. Click on the *Port Settings* tab and then click on the button that says *Advanced*. In the *Advanced Settings* dialog box, change the *Latency Timer* from the default value of 16msec to 1msec as shown below. Click OK to close the *Advanced Settings* dialog box.



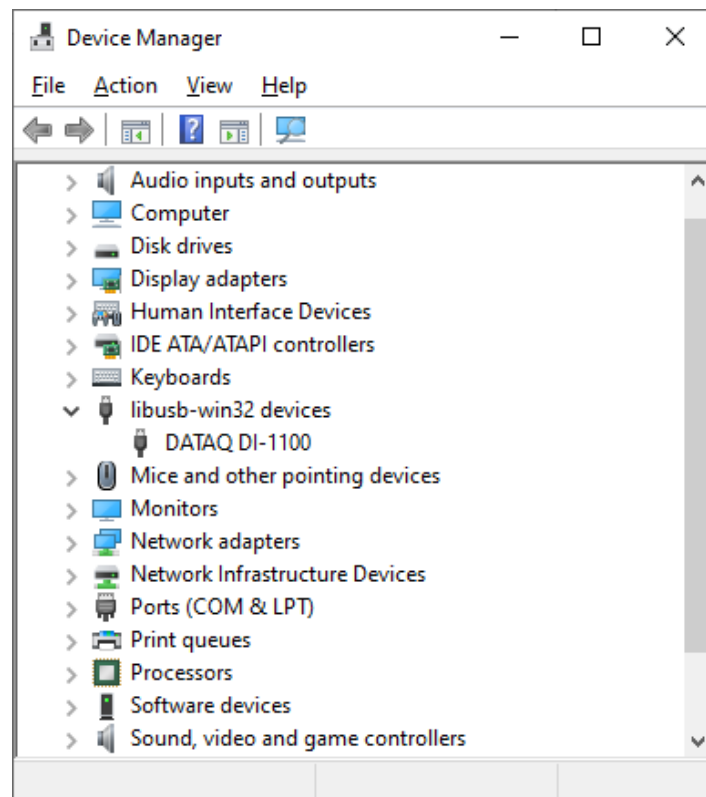


Next, it is important to verify that the correct version of the FTDI driver was installed. On the COM port properties dialog box, click the *Driver* tab. Verify that version 2.8.30.0 was installed as shown below. The importance of this step is to ensure that a newer version of the FTDI drivers is not installed which could cause your diagnostic cable to become incompatible with ByteLogger. After verifying the correct version of the FTDI drivers, click OK to close the COM port properties dialog.



If the analog USB data acquisition was purchased from DATAQ Instruments, some additional steps are necessary to finish the installation. Plug the DI-1100 into an available USB port on your computer. If the drivers from DATAQ were installed in the previous step, you might see Windows finalizing the installation from two small popups that appear in the task bar (Windows 7). Otherwise, it will happen in the background.

Afterwards, the DATAQ DI-1100 should appear in the *Device Manager* under *libusb-win32 devices* as shown below. If it does not appear in *Device Manager*, then ByteLogger will likely not recognize that it is connected to your computer.



Troubleshooting

If you purchased a compatible diagnostic cable from Renovelo and it ever becomes unrecognizable by Windows, check to see if it appears in the *Device Manager*. If it does appear, check to see if a newer version of the FTDI drivers has been accidentally installed. If it cannot be found in the *Device Manager*, contact a representative at Renovelo for further assistance.

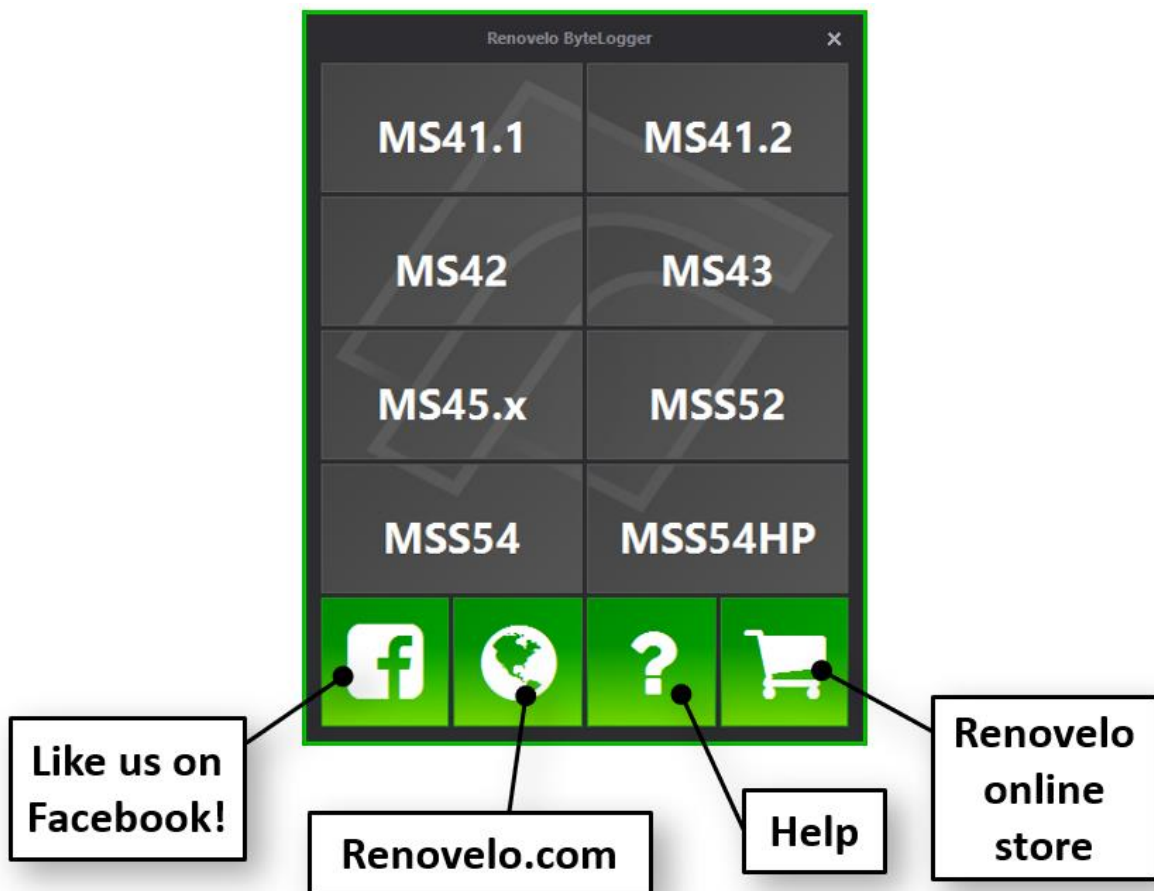
We only offer technical support for cables purchased from Renovelo.



Getting Started.

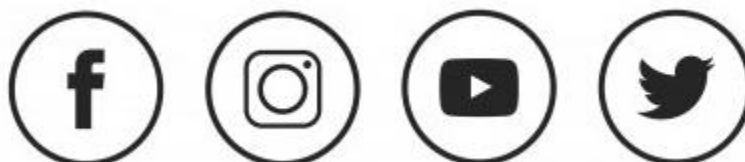
The Basics

When first launching ByteLogger, the following menu will appear. Here you can find buttons which will configure the tool to communicate with the appropriate DME. Along the bottom are some other buttons that can help you contact us if needed.



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Determining DME Type

As seen previously, the opening menu offers you multiple DMEs from which to choose. The easiest and most fool-proof way to determine this is to physically check your DME. The DME can be found in the engine bay near the firewall of the vehicle. Depending on the type of vehicle, this could be on the driver's side or the passenger's side. In some early model OBD2 vehicles (such as the E36 chassis), it is located in a small compartment within the firewall behind a protective cover. Otherwise, it is usually located in a black plastic box which can be easily accessed with basic hand tools.

Once the DME has been located and removed from its compartment, it can be checked for a sticker with information about its type. Shown below is an example of the sticker from a MS43 vehicle.



The only caveat to this approach is for the E36 M3 chassis. Internally to BMW, this DME was known as MS41.2. Instead, on the side of the DME will be a sticker indicating MS41.1. The only differences between MS41.1 and MS41.2 in our software are the values for some of the gauges used to display the live engine values. For instance, the M3 has a higher redline than the base 3-series which is indicated on the tachometer. Other than that, either button will work for both MS41.1 and MS41.2. Shown below are some of the other stickers which could be seen:



User Interface

After selecting the appropriate DME, the following screen will appear. The parameters, actual layout and number of gauges could be different depending on the DME selected in the first menu. Shown below is the layout if MS41.1 is selected.



Listed along the left side of the screen are all the parameters which can be monitored. Parameters can be selected and deselected by clicking the checkbox next to them. Although the above screenshot only shows one group of parameters, some DMEs will have multiple groups of parameters.

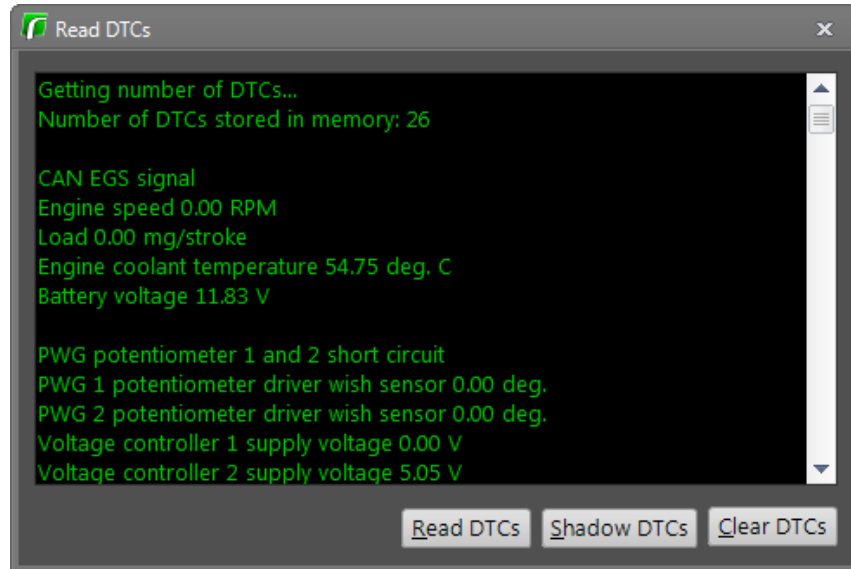
A few parameters are shown on the main part of the screen as gauges. These gauges can be repositioned on the screen by simply clicking and dragging them.

In addition, any dockable windows that appear can be repositioned anywhere on the screen. The Parameters list shown above happens to be docked to the left side of the screen by default. The Datalog window is docked to the bottom of the screen by default. To dock them somewhere else, simply click the title bar of the docked window and drag it somewhere. As soon as the window is moved from its default location, several new docking locations will appear as icons. Drag the window to one of these icons and release the mouse.

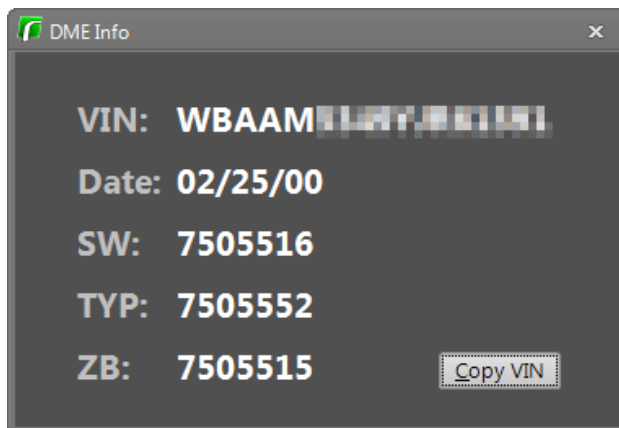
Tools



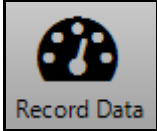
This button will open a new window and read all stored DTCs. In addition, it is possible to read shadow DTCs or clear all DTCs by clicking the appropriate buttons in this window. Detailed “freeze frame” sensor data is given for each DTC which can help you diagnose the cause of the problem as seen below.



The “DME Info” button will allow you to read more detailed information about your DME such as the VIN, the date it was last programmed by a dealer, the software number, the type number, and the ZB number as seen below.



After connecting the computer to the OBD2 port using the appropriate cable, the “Connect” button can be selected to establish communication with the DME. Once this has been done, the “Record Data” button will become enabled. If any of the parameters which are shown as gauges on the main screen are selected, you’ll begin seeing live data. Many other buttons will become disabled until the software is disconnected from the DME by pressing the “Connect” button again.



After a connection has been made to the DME by pressing the “Connect” button, this button will become enabled. Pressing “Record Data” will start a new data logging session. All of the parameters selected prior to connecting to the DME will be stored in memory until this button is pressed again. Depending on the settings, you will then either be prompted to save the file, or the file will be automatically saved with a date and timestamp.

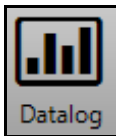


This launches the Windows calculator. Sometimes this can be quite useful when performing data logging or engine tuning.

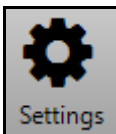
View



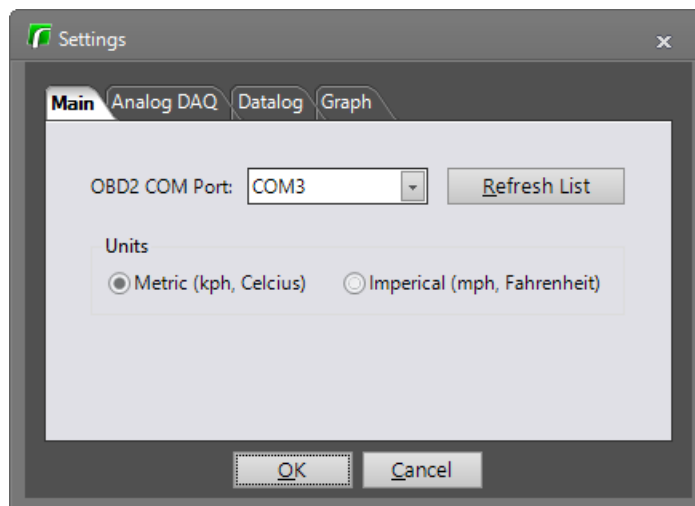
By default, this button will be selected which will show the list of parameters along the left side of the screen. If you want to temporarily hide the parameters, simply press the “Parameters” button.



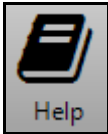
Likewise, the datalog window can be temporarily hidden by pressing the “Datalog” button.



Many of the settings can be modified. Pressing the “Settings” button will bring up a new screen as shown below. All of these settings are saved when exiting the program and reloaded upon launching it again.



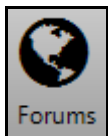
Help



Clicking the “Help” button will open this help document.



The “About” button will show you more information about this application such as the version number.



Clicking the “Forums” button will launch your default internet browser and open our user forums (<http://www.renovelo.com/forum/>). If you have a problem or question with our products, this is the best way to get in touch with us.



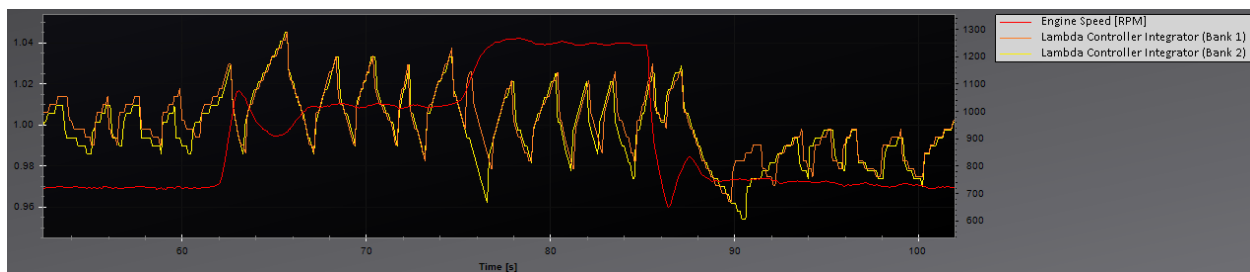
As expected, this button will launch your default internet browser and open our Facebook page (<https://www.facebook.com/renovelotuning>). You can catch the latest updates on news here. Also, don’t forget to “Like” us!

Data Logging

Follow the instructions below to start a new data logging session:

1. Connect one end of the diagnostic cable to the computer's USB port.
2. Connect the other end to the vehicle's OBD2 port. This is usually located at the bottom of the dashboard near the left side of the driver's foot well. Usually a plastic door covers the OBD2 port and must be opened to access it.
3. Start the vehicle's engine and let it idle.
4. Start the ByteLogger software on your computer.
5. Choose the appropriate DME by clicking one of the buttons in the start menu that appears.
6. Wait for the main program to launch and then establish a connection with the DME by clicking the "Connect" button in the "Tools" menu.
7. After a short pause, the "Record Data" button should become enabled. Click this button and a dockable window should automatically appear at the bottom of the screen. You should see data appear in this window immediately.
8. To stop the data logging, press the "Record Data" button again. By default, you will then be prompted to save the log file. If you wish to have the log file automatically saved each time, this can be enabled in the "Settings" dialog box.
9. If you wish to open a log file which has been previously saved, this can be done by clicking "File" and then "Open datalog".

Shown in the image below is a screen shot of a log file from a MS42 DME. This graph shows engine speed and both oxygen sensor integrators. The graph can be panned by holding the mouse wheel and moving the cursor. It can be zoomed by rotating the mouse wheel or by left clicking and dragging a window around the area of interest. To reset the graph, right click and then select "Undo All Zoom/Pan" in the context menu that appears.



Data Logging with Analog DAQ

ByteLogger also has the ability to record analog signals from any sensor which outputs 0-10V. This is accomplished by using a USB data acquisition device (DI-1100) which must be purchased from DATAQ Instruments. Shown in the tables below are the general specifications for this hardware.

Analog Inputs	
Number of channels	4
Configuration	Differential
Full Scale Range	$\pm 10\text{VFS}$
Input Impedance	1 M Ω , each input to ground
Isolation	none
Accuracy	$\pm 12.5\text{mV}$ @ 25°C
Max input w/o damage	$\pm 75\text{ V}$ peak, continuous
	$\pm 100\text{ V}$ peak, one minute or less

ADC Characteristics	
Resolution	12 bit
Max sampling rate	20-40 kHz

Power	
Power Consumption	<1.0 Watt, via USB

Indicators and Connections	
Interface	USB 2.0 (mini-B connector)
Indicators (LED)	Power, Active, Digital
Input Connections	One 16-position terminal strip

Environmental	
Operating temperature	0°C to 50°C
Operating humidity	0 to 90% non-condensing
Storage temperature	-20°C to 60°C
Storage humidity	0 to 90% non-condensing

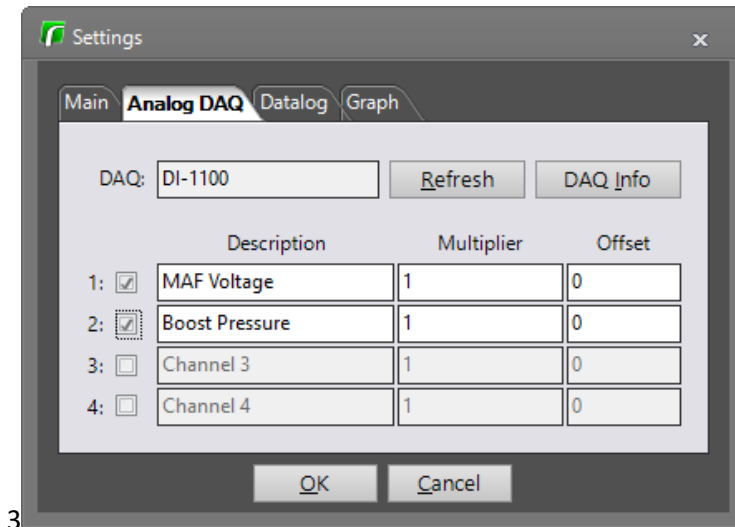
Physical Characteristics	
Enclosure	Hardened Plastic
Dimensions	2.625D \times 5.5W \times 1.53H in. (6.67D \times 13.97W \times 3.89H cm.)
Weight	3.6 oz.

Although the maximum sampling rate is 40kHz, ByteLogger samples the analog DAQ at the same rate the OBD2 port is sampled. Therefore, the actual sampling rate is limited by the speed of the DME communication with ByteLogger.

As indicated in the above specifications, the expected voltage range is $\pm 10\text{V}$. Although, higher voltages will not damage the unit (up to $\pm 100\text{V}$), it is physically impossible to read anything higher than 10V. Ensure that the sensors being measured stay within this range.

Before using the analog DAQ, it is important to configure it in the “Settings” dialog. ByteLogger should be able to automatically detect the DAQ when starting. If this does not happen, it is possible to force ByteLogger to search for the DAQ in the “Settings” dialog.

Enable channels by simply clicking on the appropriate checkbox. Next, enter a description followed by values for the “Multiplier” and “Offset”. These are the values that convert the raw voltage into real engineering units assuming a linear relationship. Usually, these conversions are supplied by the manufacturer of the sensor and can be found in supporting help documentation. If the raw voltage is desired, leave the “Multiplier” set to 1 and the “Offset” set to 0.



After the desired settings have been entered, click the “OK” button to close the “Settings” dialog. Next, connect the positive and negative wires from each sensor to the appropriate terminals of the analog DAQ using a small flat-blade screwdriver. As seen in the image below, two wires are connected to the first channel of the DAQ.



To start recording the analog signals, simply click the “Connect” and “Record Data” buttons as before. The analog signals will be recorded in parallel with the selected OBD2 channels.