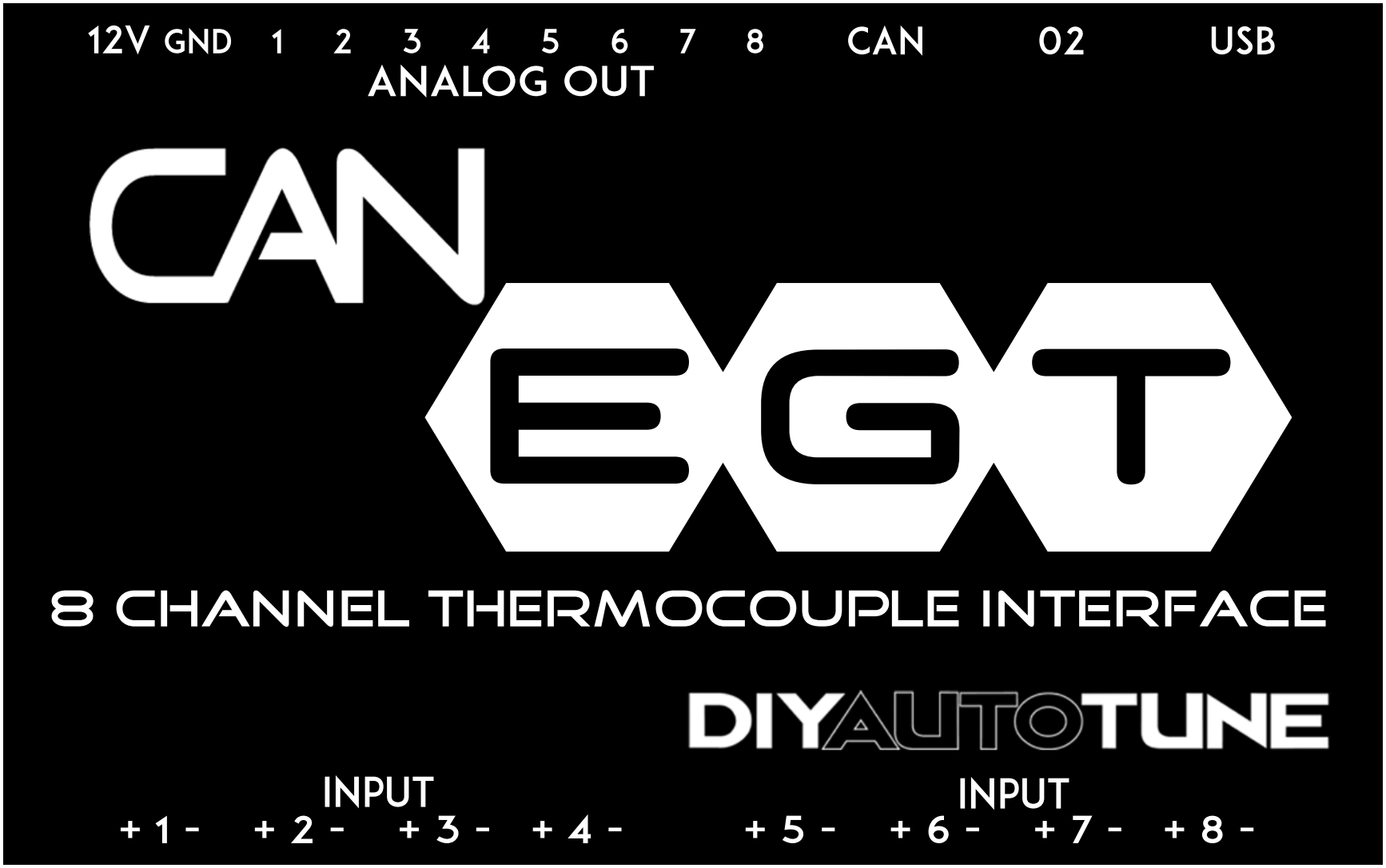


USER MANUAL

AMP EFI
ms3pro
DIYAUTOTUNE

UPDATED 4-19-18

Thank you for purchasing the CAN-EGT interface! Monitoring exhaust gas temperatures in real time, cylinder-by-cylinder, means more accurate air-fuel targets, prevention of catastrophic engine system failures and much more!

1 Introduction

Many other sensors can be wired directly to a MegaSquirt ECU, including throttle position sensors, coolant temperature sensors and narrow band oxygen sensors.

What makes EGT different?

Most automotive sensors are designed to work on a zero to five volt scale, since automotive micro-controllers typically have built in analog to digital converter circuits that can read a zero to five volt output. However, the only sensor type that holds up well to the intense heat in exhaust gas is a thermocouple, and these put out a signal in the millivolt range. Even the hottest EGT readings you produced on an engine are not likely to push the output over 0.05 volts. Therefore, converting these signals into something a 5 volt electronics system can use
requires a prescision amplifier.

The CAN-EGT board collects input from EGT probes and supplies the data to a MegaSquirt ECU through the CAN connection, or allows you to log EGT readings through the TunerStudio software over USB. It is compatible with MS3Pro, MS3, MS2, DIYPNP, MicroSquirt, and second generation MegaSquirt PNP systems. The onboard analog outputs also allow the CAN-EGT to serve as an EGT amplifier for other devices that only accept 0-5 volt signals.

CAN-EGT Features:

- 8 inputs for K-type thermocouples
- Cold junction compensation
- 0-1250° C input range
- Measures both exhaust gas and cylinder head temperature
- 8 analog 0-5 volt outputs
- CANbus connection for connecting to MegaSquirt ECU
- RS232 connection that conects to an Innovate LogChain - currently supports up to 8 Innovate wideband O2 sensors
- USB port for laptop connection
- Multiple CAN-EGT units may be daisy-chained together

2 Installation

2.1 EGT Probes

The CAN-EGT module uses standard K-type thermocouples, such as the DIYAutoTune.com Red Avenger or Black Stinger EGT probes. Up to 8 two-wire thermocouples attach to the appropriate inputs (+1- through +8-) with screw terminals at the bottom of the CAN-EGT.

*NOTE** K-type thermocouples have an industry standard marking in North America: *Red is negative, yellow is positive*. This can be a bit confusing as a lot of equipment uses red for positive. The yellow terminals go to the + inputs, and the red terminals to the -. Contact the manufacturer if your K-type thermocouples have a different wiring color scheme.

Do not attempt to extend a thermocouple's wiring with copper wire, as this will likely skew the reading.

2.2 Power and Ground

The CAN-EGT can be powered through either the CAN plug or the 10 pin terminal block.

For the provided CAN plug, the tip is 12 volt power and the sleeve is ground.

For the 10 pin terminal block, the 12 volt power and ground pins are marked on the case lid. It should receive switched 12 volt power with a 2 amp fuse. We recommend grounding the CAN-EGT unit to the cylinder head or engine block, preferably close to the location of one of the EGT probes. Grounding the CAN-EGT to the same as the probe bodies will make for a more
accurate reading.

2.3 Connecting CAN-EGT to a MegaSquirt ECU

The provided 4 pin barrel plug allows using a single point for power, ground, and CAN connections. The wires are color coded, as follows:

Green	**Ground to engine block**
Red	**12 volt power**
Black	**CAN H**
Yellow	**CAN L**

If you are wiring up a 4 pin barrel plug from scratch, use these connection points:

The tip is for 12 volt power (use the same source as the MegaSquirt), and the sleeve connects to ground. The ring next to the tip connects to CANH, and the ring next to the sleeve connects to CANL. *Note** The CAN connection is NOT "hot-swappable" - you must not have the CAN-EGT powered up when the CAN cable is connected.

2.4 Connecting to data logging devices with 0-5 volt analog inputs

The CAN-EGT board has 8 linear analog outputs for use with other devices, under the numbered terminals on the 10 pin connector. They provide 0 volts at 0° C and 5 volts at 1250° C, with a slope of 4 mV/°C.

2.5 Connecting an Innovate LC-2

The CAN-EGT board can talk to Innovate LC-2's directly over serial, bypassing any digital to analog conversions. Simply connect the LC-2's OUT serial connection to the WB port on the CAN-EGT board, using a standard Innovate serial patch cable. You may daisy-chain & connect up to 8 LC-2's with current firmware. Make sure to insert the terminator plug on the IN connection of the first LC-2 in the chain.

2.6 Internal Switches

There is a 3 position DIP switch inside the enclosure on the CAN-EGT board. By default, they are all set to ON. Here is what the switches do:

V+ and GND: These should be set to ON if you are powering the CAN-EGT through the 10 position screw terminal and using the CAN cable to power a second CAN device (maximum current 100 mA). They should also be set to ON if you are powering the CAN-EGT board through the CAN cable. Under any other circumstances, set this to OFF.

R: (Termination Resistor) Switch this ON if the CAN-EGT is the last node on the CAN network, OFF if there are other nodes down the line.

3 TunerStudio Settings

The CAN-EGT communicates with TunerStudio either directly through its USB port, or through a MegaSquirt ECU in CAN passthrough mode. Either way, the CAN-EGT will need to be configured with the appropriate INI file. If you do not have a copy of this file from TunerStudio and it does not auto-detect the firmware, you may download it here:

CURRENT CAN-EGT Firmware & Configuration File (download .ZIP FILE)

Save the file in a convenient folder, such as the TunerStudio Projects folder in My Documents for most Windows installations.

3.1 Connecting to TunerStudio via USB

Click the *Other Firmware* checkbox, select Browse, and specify this file. There are two project properties settings you may specify. The Temperature Display option lets you display degrees in Fahrenheit or Celsius. The Serial setting allows you to chose whether you are connecting to the CAN-EGT directly over over CAN. If connecting directly to the CAN-EGT using USB, select Activated.

After creating your project, go to File -> Project -> Project Properties to set up the CAN Devices tab. If TunerStudio is communicating directly to the CAN-EGT, set the Main Controller CAN ID to 1. If the CAN-EGT will be connected to an MS3, set the Serial Protocol drop down box to “Force - MS3 1.1+”.

3.2 Connecting to TunerStudio through an MS2 or MS3

The MS2 will require setting up Project Properties; with an MS3, this is not required to read data from a CAN-EGT.

3.2.1 Project Properties

When connecting to an MS2, you will need to set up the CAN-EGT under the CAN Devices tab, under Project Properties from your MegaSquirt project in TunerStudio. (This is not required on an MS3 unless you wish to change the settings on the CAN-EGT itself in pass through mode.)

1 Click the "+" button next to the CAN Devices field to add the CAN-EGT. Type in an appropriate description under the Device Identifier and Device Description. The CAN Device ID defaults to 1; you only need to change this if you already have another device with this ID on your network.

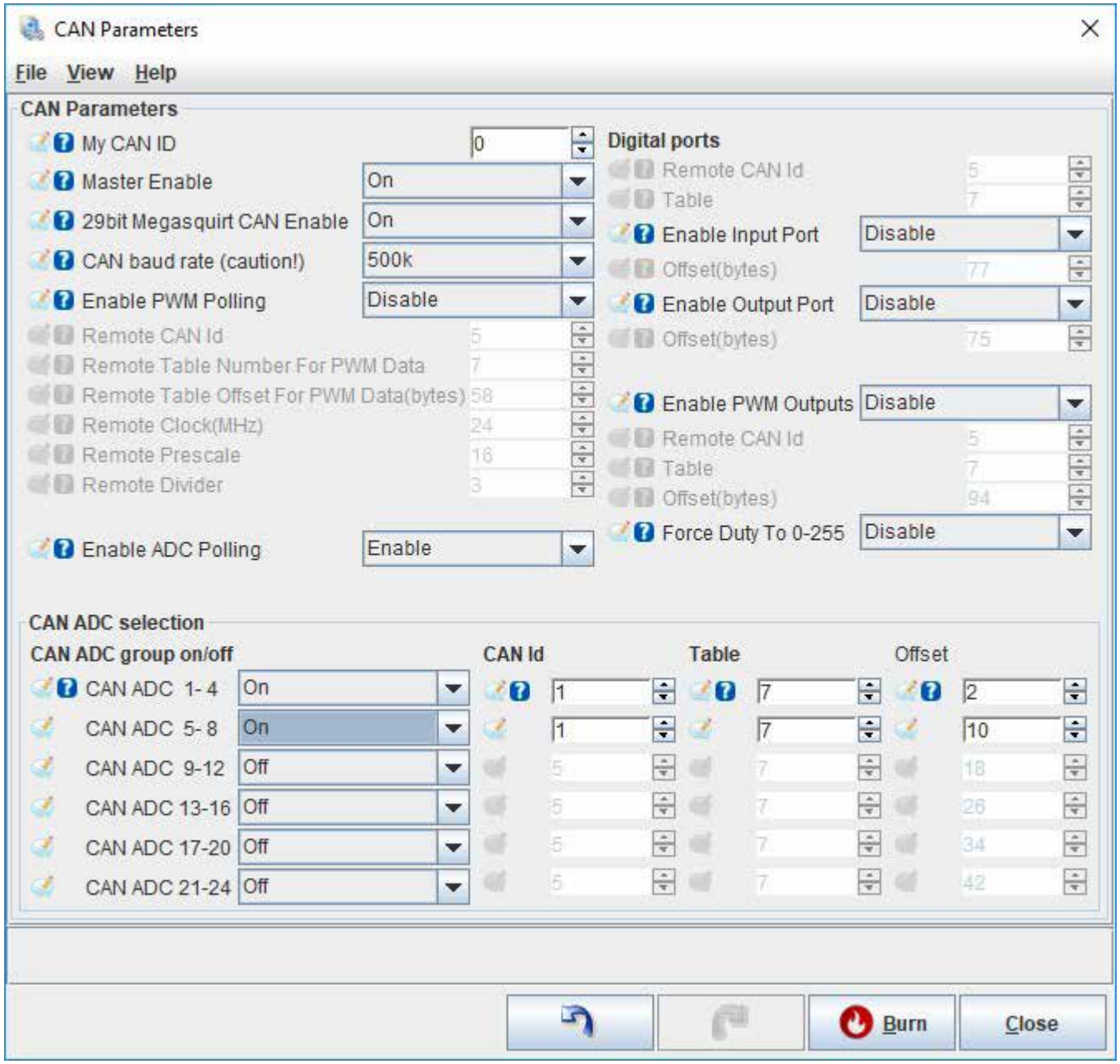
2 Click the "..." button under Device Configuration File, and select the CAN-EGT configuration file (.ini). The CAN-EGT configuration settings will then appear underneath the Device Configuration File field. Since you are connecting over CAN passthrough, set Serial to Deactivated.

3 Make your selection on the check box marked Disable Runtime Data. *NOTE** For MS3, checking this box will ensure MS3 logs EGT readings on its own. For MS2 applications, you may leave it unchecked if you wish to use the CAN-EGT to log both AFR and EGT readings at the same time, however, checking the box will speed up data logging significantly if you only need one or the other.

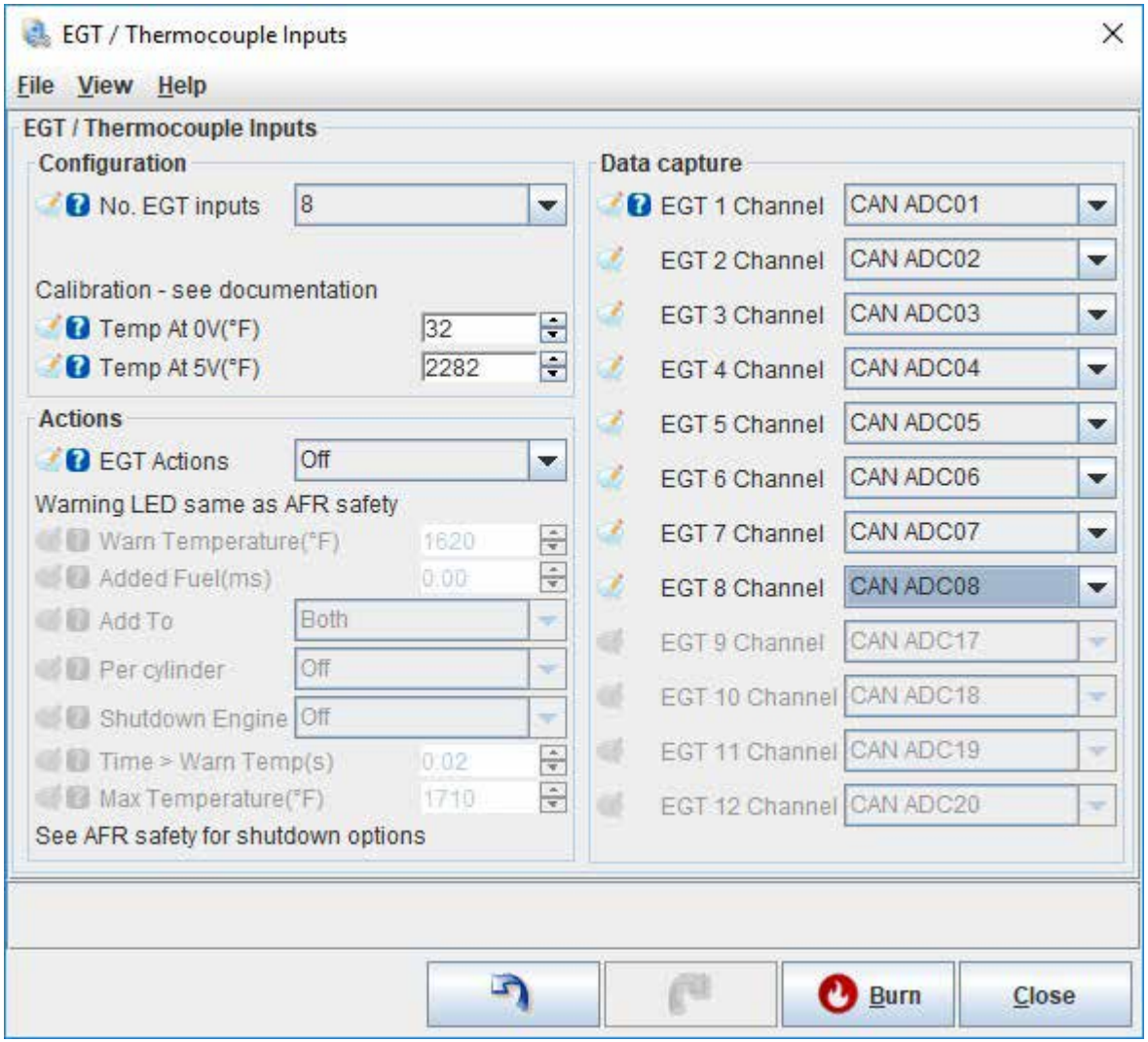
4 Once you click OK, TunerStudio will refresh and display two new buttons marked "CAN EGT setup" and "Data" used to send settings to the CAN-EGT.

3.2.2 MS3 Settings

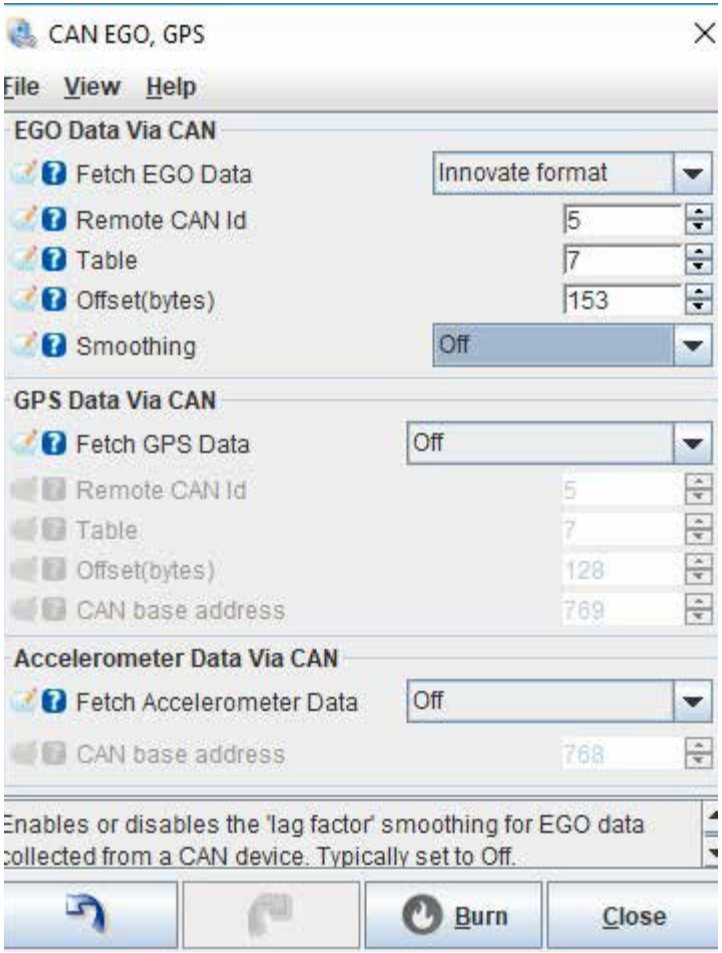
Under the CAN bus / Testmode parameters, use the settings below under CAN parameters:



Under the Advanced Engine menu, you can enable thermocouple input under the EGT / Thermocouple Inputs screen. EGT channels 1-8 correspond to CAN ADC01 through CAN ADC08, as shown in the screen below. For Calibration, set Temp at 0V to 32 °F or 0 °C, and Temp at 5V to 2282 °F or 1250 °C. See the appropriate MS3 manual for Actions settings.



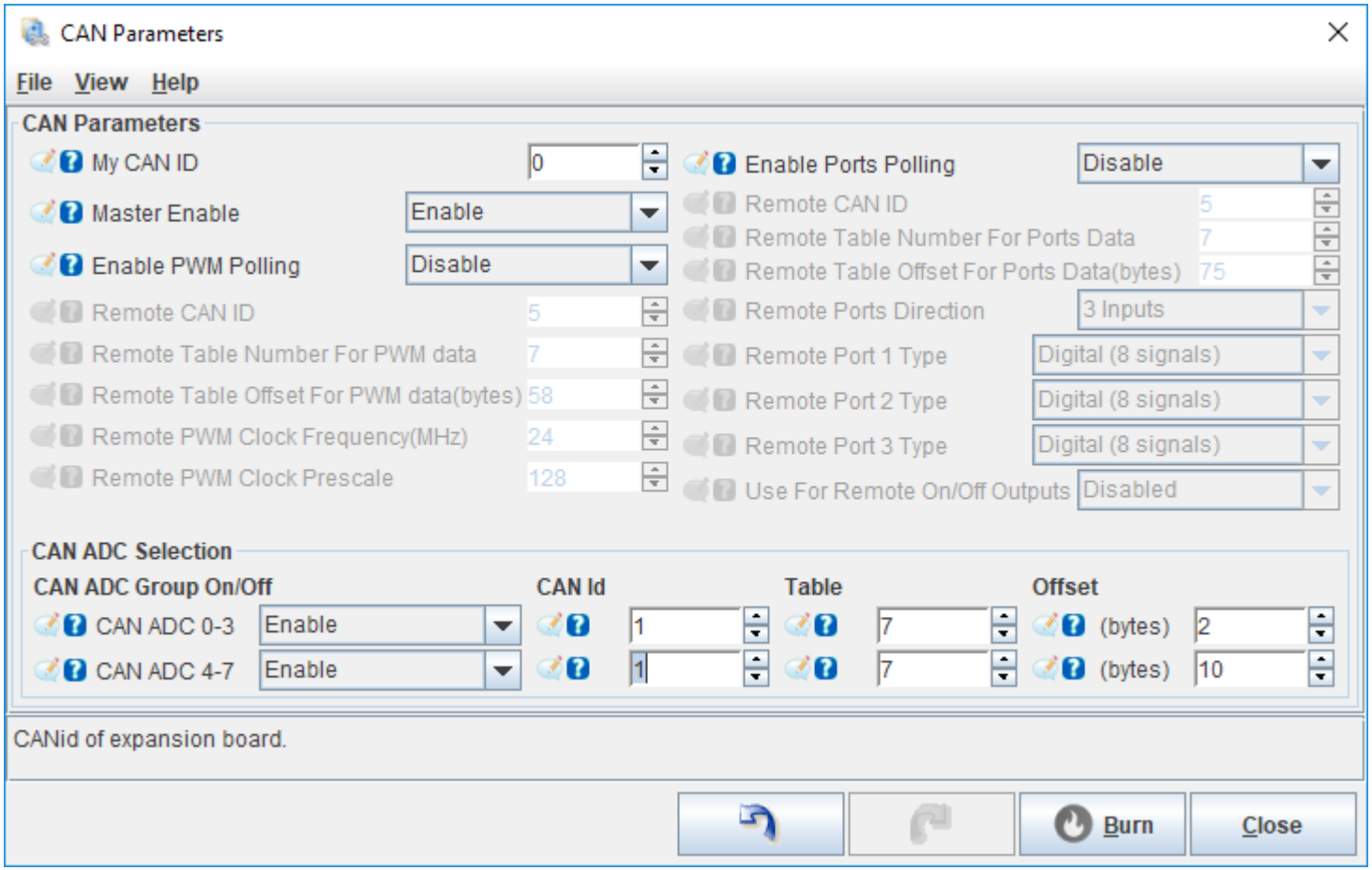
To enable air/fuel ratio data over CAN, navigate to the CAN bus / Testmode menu and select the “CAN EGO, GPS” screen from the menu. Set the wideband EGO data via CAN section to the following:



Finally, in the Fuel Settings Menu, select AFR / EGO Control, and enter the number of sensors. Set all EGO ports in use to CAN EGO. Then, assign the EGO sensors to their respective cylinders under AFR / EGO Sensor Mapping.

3.2.3 MS2 Settings

To configure MS2 to communicate with CAN-EGT, navigate to the CAN bus/ Testmode menu, select CAN Parameters and enable the following settings:



If you have checked the Disable Realtime Data box in the Project Properties to speed up data logging, you will need to download this custom INI file for EGT logging and save it in the ProjectCfg subfolder in your TunerStudio project folder. If you are using the CAN-EGT's LC-2 digital input, you must change the Remote Table Offset for ADC Data number from 2 to 153.

*Note** If you set the Remote Table Offset to 153, the only way to view or log the EGT data with current firmware (this may be changed in future releasesof MS2/Extra) is to uncheck Disable Runtime Data. Currently, there are no EGT specific settings in MS2/Extra, as MS2/Extra uses the EGT only for logging. To use the air/fuel ratio data from the CAN-EGT board for wideband correction, go to Basic Setup -> EGO Control, and change 1st EGO sensor port from Local to "Remote ADC0." If you wish to use a second LC-2, set 2nd EGO sensor port to "Remote ADC1."

3.2.4 ADC Settings

ADC resolution changes the accuracy the inputs use. Current MS3 firmware requires setting this to 10 bits. You can set the EGT inputs that are actually connected to Active, and EGT inputs that are not in use to Disabled. The Lag Factor setting allows for software noise reduction. Valid entries are 1 through 100. It multiplies the current sample by the Lag Factor as a percent and the previous setting by 100% minus the Lag Factor to get the reading. 100% Lag Factor means no filtering, while 0% Lag Factor will prevent the EGT readings from updating at all. As EGT inputs are fairly noise sensitive, we recommend using a lag factor from 10 to 30. In our experience, this lag factor still responds quite well, but filters out noise.

3.2.5 Serial Ports Settings

These sttings allow connecting an LC-2 (or a daisy chained set of multiple LC-2's) to the "WB" connection. To communicate with the LC-2, set Serial Port 2 Baud Rate to 19200, and set Auxilary Data Configuration to "Enable LC-2 reading from serial port 2". If you want to configure the LC-2's from the PC, you need to enable the serial passthrough.

*IMPORTANT NOTE** NEVER enable serial passthrough if you only communicate to the CAN-EGT using the USB port; only use this when connecting through CAN passthrough. This will disable the serial port communication because the CPU no longer looks at the data from the PC but simply passes it along to the serial port. The only way to recover from this is to use a CAN device or reload the firmware to reinitialize the setting.

4 Updating Firmware

Normally, you will not need to reload the firmware, but reloading the firmware can serve as a "reset button" to erase corrupted settings. It is also possible that we may release future firmware upgrades to provide additional functionality. To reload the firmware to the CAN-EGT, download the can-egt_firmware.zip file and copy its contents to a new folder. Right click on the ioxloader.bat file and select Edit. Navigate to the line: "ioedlser COM1 115200 can_egt.s19". Edit COM1 to the current COM port number of the USB port the CAN-EGT is using. Then save the file and double click it. The firmware will begin loading.

For technical service questions regarding your CAN-EGT, please email support@diyautotune.com