



TC-4 PLUS User Manual

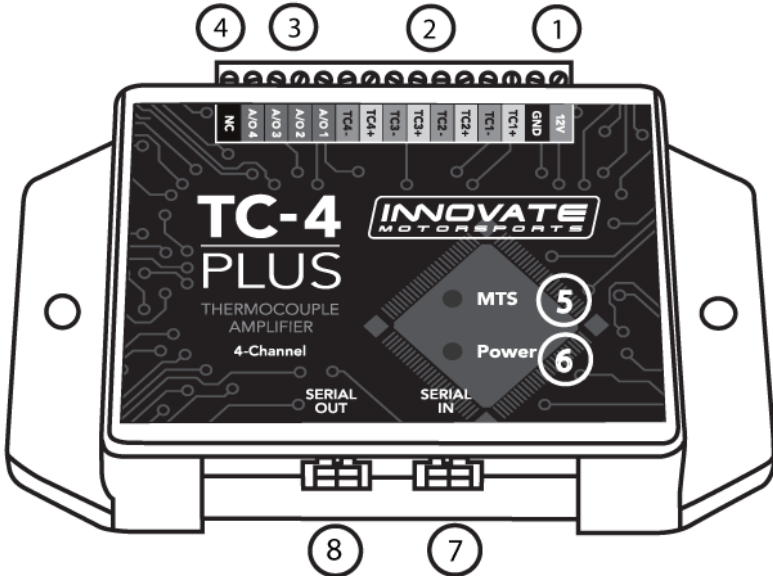
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1 TC-4 PLUS

The TC-4 PLUS is a 4 channel type K thermocouple interface device to measure temperatures. The four inputs can measure temperatures from 76 degF to 1999 degF (24 degC to 1093 degC.)

The TC-4 may be used as a stand-alone system or daisy chained with other Innovate Motorsports MTS products for data logging.

1.1 Getting to Know the TC-4 PLUS



1. **12V and GND** - These terminals are used to power the device
2. **TCx+ and TCx-** - These terminals are inputs for Type K Thermocouples
3. **A/Ox** – Analog Outputs for the respective inputs.
4. **NC** – “No Connect”, this terminal is not used.
5. **MTS Light** – Blinks indicating the SSI-4 PLUS is sending out Innovate MTS serial data
6. **Power Light** – Indicates when the unit is powered on.
7. **Serial IN** – Allows the TC-4 PLUS to be daisy chained to other Innovate Motorsports products for data logging purposes.
8. **Serial OUT** – Used to connect the TC-4 PLUS to a computer for programming or logging. This port can also be used to daisy chain additional Innovate Motorsports products for data logging purposes.

2 Wiring and Setup

Setup for the TC-4 PLUS requires the unit to be connected to power and the Type K Thermocouple(s) connected to the terminal strip.

2.1 Powering the TC-4 PLUS

1. Connect the **12V** terminal to a switched 12V source. A switched 12V source comes ON as soon as the ignition on the car is keyed on. Make sure the connection is fused with a minimum fuse size of 2A.



Circuits that share power with the vehicle's stereo, ignition system, and fuel pump are not to be used.

2. Connect the **GND** terminal to a ground source. Avoid noisy ground sources, such as grounds used for the radio and or ignition.

2.2 Connecting the Type K Thermocouples

When connection the thermocouple to the terminals on the TC-4, be sure to connect the yellow lead to the + and red lead to the - terminals.

If the thermocouple is ungrounded, run a wire from the respective TC-terminal to GND.

2.3 Analog Outputs (A/O terminals)

Optionally, the Analog Outputs (A/O terminals) can be connected to the analog inputs of other devices such as data loggers or ECUs. There is one analog output for each respective temperature channel.

It is assumed that the TC-4 PLUS and the device the analog output is being feed to are already sharing the same 'ground'. In a vehicle, this is generally true, but there can be small offsets in voltage when devices are grounded to the chassis at different points. You can minimize these offsets by sharing a good, common ground point.

The analog outputs are fully programmable and can be modified with the LM Programmer software. The factory default output configuration for all channels is $0\text{ V} = 76\text{ degF}$ (24 degC) and $5\text{ V} = 1999\text{ degF}$ (1093 degC).

3 Download the Logworks 3 Software Package

1. Open your web browser and go to:
<http://www.innovatemotorsports.com/support.php>
2. The LogWorks 3 software download will be the very first thing on the page, click the link to download the software.

3.1 *Installing software*

1. Double click on the Logworks 3 installer previously downloaded.
2. The installer will start, follow the prompts to install the software.
3. Once the software has been installed the LogWorks software, LM Programmer and TC-4 PLUS manual can then be located by navigating through Start->Programs->LogWorks3.

3.2 *Connecting to LM Programmer*

LM Programmer is used to update firmware, change fuel types, and program the two analog outputs.

1. Make sure that nothing is connected to the Serial IN port of the TC-4 PLUS
2. Connect the Serial OUT port of the TC-4 PLUS to the provided serial programming cable. Connect the other end of the serial programming cable to your computer. If your computer does not have a serial port, you can purchase a USB to Serial adapter from Innovate Motorsports (P/N 3733) or use any USB to serial adaptor that includes drivers.
3. Power up the TC-4 PLUS
4. Launch LM Programmer. The LM Programmer application can be launched from *Start->Programs->LogWorks3->LM Programmer* from the Windows task bar.

3.2.1 *Changing the device name*

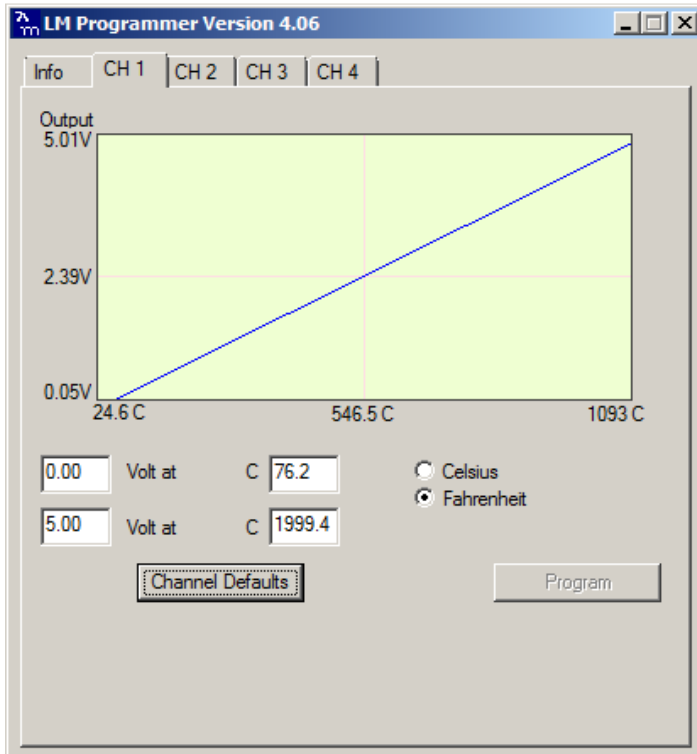
In the 'Info' tab of the software there is a dialog box to name the device. This is used to identify the unit if multiple TC-4 PLUS devices are used in a Log-Chain. Enter any unique name up to 8 characters.

3.2.2 Updating the firmware

Click on the 'Update Firmware' button. You will be presented with a file dialog box that allows you to select a firmware file. Firmware files end with the file extension .dld. If available, new firmware releases will be downloadable from the Innovate Motorsports support web site.

3.2.3 Analog Outputs

Each individual temperature channel can be programmed to output a custom output.




This shows the analog output voltages versus degF for one of the four analog outputs. The graph display is automatically scaled to the selected voltages. For each output you can specify a minimum and maximum temperature in Fahrenheit or Celsius and the associated voltages.

Once changes are made, click the **Program button** for the changes to take effect.

Factory Programmed Defaults

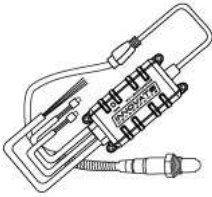
The factory default output configuration for all channels is 0 V = 76 degF (24 degC) and 5V = 1999 degF (1093 degC).

3.3 Logging Data from your TC-4 PLUS with LogWorks

1. Connect the OUT port of the TC-4 PLUS to the provided serial programming cable. Connect the other end of the serial programming cable to your computer. If your computer does not have a serial port, you can purchase a USB to Serial adapter from Innovate Motorsports (P/N 3733) or use any USB to serial adaptor that includes drivers.
2. Make sure that nothing is connected to the IN port of the TC-4 PLUS.
3. Power up the TC-4 PLUS
4. Launch LogWorks. The LogWorks application can be launched from *Start->Programs->LogWorks3->Logworks3* from the Windows task bar.
5. Once LogWorks launches go to *File->Connect*. You will be prompted to connect to the serial COM port. Select the comport the device is connected to and then click Connect.
6. *To start recording go to File->New Realtime Log* or, in the Toolbar, click on the  Tool.

3.3.1 Adding and Logging MTS channels

The Innovate Motorsports' MTS (Modular Tuning System) allows you to daisy chain multiple devices together via the serial IN and OUT connectors to form one single synchronous log. MTS log chains can consist of a single unit connected directly to a laptop (connect your *TC-4 PLUS* directly to a computer,) two units, or multiple devices connected together, up to 32 channels. Below is a MTS logging example using a PL-1 to record the information on a SD memory log:



LC-2 x 4

4 channels
Air/Fuel Ratio



TC-4 PLUS

4 channels of EGT



PL-1

Recorded to
SD Card in Pocket
Logger

Innovate Motorsports' MTS devices have two types of serial interface connectors, the legacy 2.5mm stereo and the 4 pin Molex. The following patch cables are available to interface your devices together:

4 Pin Molex to 4 Pin Molex - 4ft	p/n 3846
2.5mm to 2.5mm Stereo - 4ft	p/n 3760
2.5mm to 2.5mm Stereo - 6in	p/n 3789
4 Pin Molex to 2.5mm Stereo - 4ft	p/n 3812

Appendix A: Limited Warranty

LIMITED WARRANTY

Innovate stands behind the quality of its products. Innovate makes the following warranty to purchasers of its products: All new Innovate products carry a six-month warranty from the date of purchase. If proof of purchase cannot be provided, warranty will be determined by date of manufacture.

When Warranty Void

This warranty shall terminate and Innovate shall have no obligation pursuant to it if (i) your Innovate product has been modified or repaired in a manner not previously authorized by Innovate in writing, (ii) the identification markings on your Innovate product have been removed, defaced, or altered; (iii) your Innovate product was subjected to accident, abuse, shipping damage, or improper use; (iv) your Innovate product was not used or configured as specified in the product manual; or (v) your Innovate product was subjected to operating conditions more severe than those specified in the product manual.

Exclusions From This Warranty

Oxygen Sensors are excluded from this warranty.

Repairs Under This Warranty

In the unlikely event that your Innovate hardware product should prove defective during the warranty period, contact Innovate Customer Support for a return material authorization (RMA) at 949-502-8400. Products returned for service must be securely packed to prevent damage and shipped charges pre paid, along with proof of purchase and the return material authorization number, to the Innovate repair location as instructed by Customer Service. Innovate within a reasonable amount of time from its receipt of your product so shipped, will ship to you, at its option, the repaired product or a new or reconditioned product of comparable or greater specified functionality. All repaired or replacement products shall be warranted for the remainder of the original product warranty.

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