



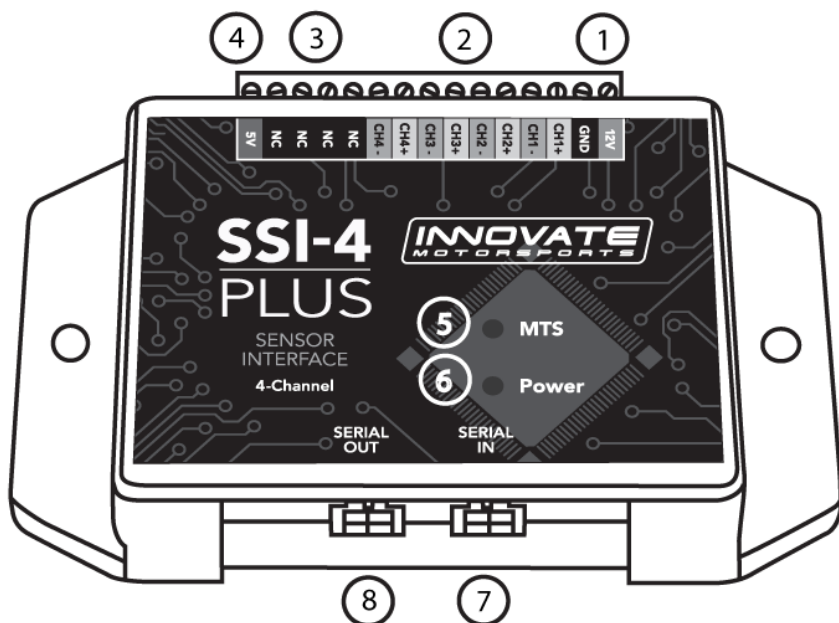
SSI-4 PLUS User Manual

1	SSI-4 PLUS	2
1.1	Getting to Know the SSI-4 PLUS	2
1.2	Channel Functions	3
2	Wiring and Setup.....	3
2.1	Powering the SSI-4 PLUS	3
2.2	5V for External Sensors	4
2.3	Measuring Frequencies (RPM, Speed, Duty Cycle)	4
2.3.1	Engine RPM	4
2.3.1.1	Attenuating a Tach Signal	4
2.3.2	Duty Cycle	5
2.3.3	Speed Sensor and Frequencies.....	5
2.4	External 0-5 Volt Sensors	6
3	Download the Logworks 3 Software Package	6
3.1	Installing Software	6
3.2	Connecting to LM Programmer.....	6
3.2.1	Changing the Device Name	7
3.2.2	Updating the Firmware	7
3.2.3	Input Configurations	7
3.2.3.1	Measuring RPM (Channel 1 and 2).....	8
3.2.3.2	Measuring Speed (Channel 1 and 2)	8
3.2.3.3	Measuring Frequency (Channel 1 and 2).....	10
3.2.3.4	Measuring Dwell (Channel 2)	10
3.3	Logging Data from your SSI-4 PLUS with LogWorks	10
3.3.1	Adding and Logging MTS channels	11
	Appendix A: Limited Warranty	12

1 SSI-4 PLUS

The SSI-4 PLUS will allow the capture of data from 4 external sensors. These sensors can be frequencies such as engine RPM and speed sensors or 0-5V references like MAP sensor and pressure transducers. The SSI-4 PLUS may be used as a stand-alone system or integrated with other Innovate Motorsports MTS products to create a log chain.

1.1 Getting to Know the SSI-4 PLUS



1. **12V and GND** - These terminals are used to power the device
2. **CHX+ and CHX-** - These terminals are inputs for external sensors
3. **NC** – “No Connect”, these terminals are not used.
4. **5V** – 5 Volt output to power external sensors
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 up
7. **Serial IN** – Allows the SSI-4 PLUS to be daisy chained to other Innovate Motorsports products for data logging purposes.
8. **Serial OUT** – Used to connect the SSI-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.

1.2 Channel Functions

The following table shows the function of each of the 4 channels of the SSI-4 (the default factory settings of the SSI-4 are highlighted):

Channel	Functions
Channel 1	RPM (8 Cyl, 4 Stroke) Speed Sensor Frequency External 0-5V
Channel 2	RPM Speed Sensor Frequency Duty Cycle External 0-5V
Channel 3	External 0-5V
Channel 4	External 0-5V

2 Wiring and Setup

Setup for the SSI-4 PLUS entails that the unit itself be connected to power, external sensors be connected (frequencies or 0-5V references), and the system be configured via the LM Programmer software to correctly interpret the sensors connected.

2.1 Powering the SSI-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 recommended.

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 5V for External Sensors

The terminal labeled 5V can be used to power external sensors. External sensors do not HAVE to be powered by the SSI-4 PLUS. The 5V output is a convenience for external sensors when no 5V supply is available. The 5V supply can power sensors with a total power consumption of up to 300Ma.

2.3 Measuring Frequencies (RPM, Speed, Duty Cycle)

The SSI-4 PLUS has the capability of processing two frequency channels. The inputs for these types of channels are reserved on channel 1 and 2. In addition to wiring in the external sensors, frequency inputs require additional programming through LM Programmer to correctly interpret the signal.

2.3.1 Engine RPM

Engine RPM can be measured in either channel 1 or 2 of the SSI-4 PLUS. The tach signal can be acquired from the negative lead of a coil, ECU, negative lead of an injector, or ignition box (i.e. MSD 6AL).

Note: Ignitions running a multi-spark setup (i.e. MSD ignitions) must use the provided tach signal from the ignition box.



A tach signal cannot be acquired from the negative lead of the coil on vehicles with CDI ignitions. For these applications use the negative lead of an injector or a tach adapter (if available for your model ignition).

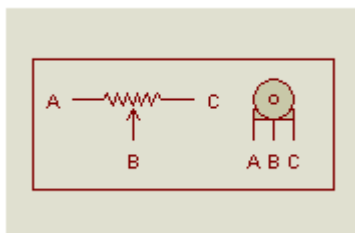
1. Connect the tach signal to the CH+ input screw terminal.
2. *If required to obtain a signal:* Connect the CH- signal to the ground of the RPM signal source.

2.3.1.1 Attenuating a Tach Signal

The problem of an erratic tach signal happens if there is a lot of ringing at high voltages. To counteract this, it is sometimes necessary to attenuate the

tach signal by about 30dB or so. This is accomplished with a 100k variable potentiometer which can be purchased at any electronics store.

1. Connect the tach signal to terminal A.
2. Connect terminal B to the tach signal input on the SSI-4 PLUS.
3. Connect the terminal C to Ground.



1. Turn the pot all the way to the right (until no RPM is registered).
2. Start turning the pot to the left and adjust it to the point where RPM starts to register. Further adjustments might be necessary to fine tune the filter.

2.3.2 Duty Cycle

The Duty Cycle measurement can only be setup on channel 2 of the SSI-4 PLUS. Duty cycle is defined as the ratio between the time a signal is active and the total time of the active and inactive time.

1. Connect the signal output to the CH2+ input screw terminal. If measuring injector duty cycle, your signal source can be pulled from the negative lead if the injector.
2. Connect the CH2- signal to the ground of the signal source.

2.3.3 Speed Sensor and Frequencies

The SSI-4 PLUS can be set to any frequency range between 0 and 30 Hz to 0..15 kHz for the full logging range.

1. Connect the signal output to the CH2+ input screw terminal. If measuring injector duty cycle, your signal source can be pulled from the negative lead if the injector.
2. Connect the CH2- signal to the ground of the signal source.

2.4 External 0-5 Volt Sensors

The SSI-4 PLUS's external connections are differential. This means that each input channel has 2 input terminals. A + terminal and a – terminal which both need to be hooked up for the SSI-4 PLUS to read the input accurately. This is done to eliminate ground offsets in the signal.

1. Connect the signal output from the 0-5V sensor to the channel + terminal
2. Connect the ground reference to the – terminal.

Channels 2,3, and 4 are programed from the factory to receive a 0-5V input. Channels 3 and 4 are permanently reserved for this type of input.



The (–) input on the SSI-4 PLUS is NOT a ground itself. The external sensor must be connected to a ground source. From the external sensor ground source, run a wire to the – terminal.

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 SSI-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, rename the device, and program the inputs.

1. Make sure that nothing is connected to the Serial IN port of the SSI-4 PLUS

2. Connect the Serial OUT port of the SSI-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 SSI-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

If multiple SSI-4 PLUSes are used in a Log-Chain, each can be given a unique name so that LogWorks can identify each SSI-4 PLUS. Just enter a name in the edit box in this page.

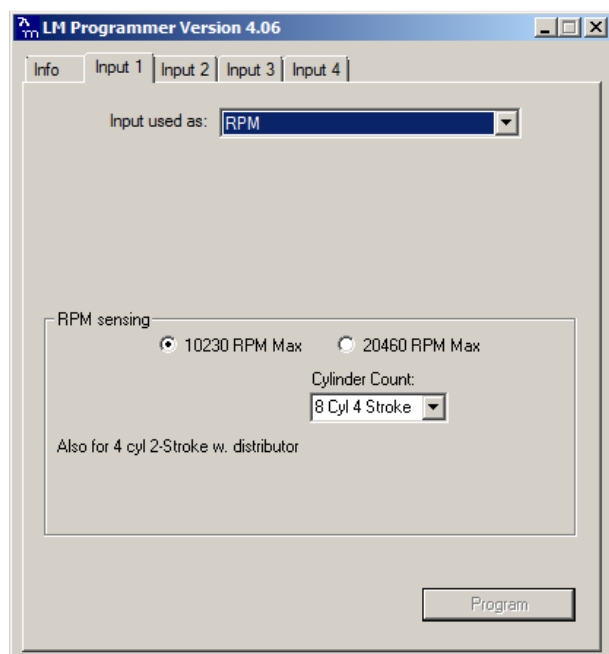
3.2.2 Updating the Firmware

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 Input Configurations

Click on the appropriate Input tab in the top of the window to configure one of the SSI-4 PLUS inputs. The drop-down list at the top of the window allows you to select the different functionality for that input. Channels 1 and 2 can be configured for different types of frequencies or 0-5V inputs. Channels 3 and 4 are reserved for 0-5V inputs.

3.2.3.1 Measuring RPM (Channel 1 and 2)

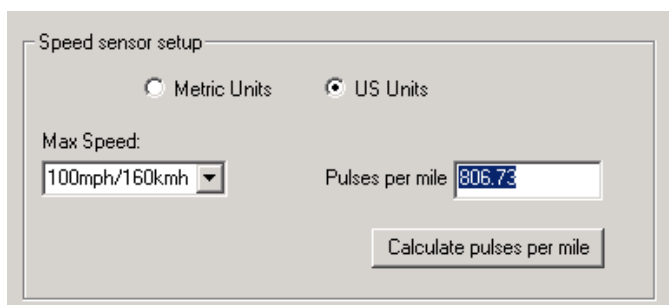


Select the cylinder count in the appropriate drop-down list. The channel can be configured for a maximum RPM range of either 10230 or 20460.

Click the 'Program' button to upload the new programming data into the SSI-4 PLUS. Once the unit is programmed, the 'Program' button will grey out.

3.2.3.2 Measuring Speed (Channel 1 and 2)

Select the Speed Sensor function in the drop-down list. The center section of the window changes to:



Speed sensor setup

☐ Metric Units
 ☒ US Units

Max Speed:

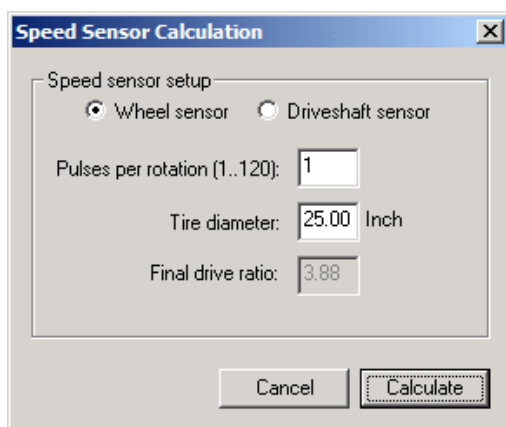
100mph/160kmh

Pulses per mile 806.73

Calculate pulses per mile

With the radio buttons you can select to use metric (km/h) or US (mph) units. In the left drop-down list you select the max speed to be measured.

In the right edit box you enter the pulses per mile the speed sensor produces. Speed sensors are typically pulse sensors mounted either on the drive-shaft or wheel. To calculate the pulses per mile (or km/h) click on the calculate button:



Speed Sensor Calculation

Speed sensor setup

☒ Wheel sensor
 ☐ Driveshaft sensor

Pulses per rotation (1..120): 1

Tire diameter: 25.00 Inch

Final drive ratio: 3.88

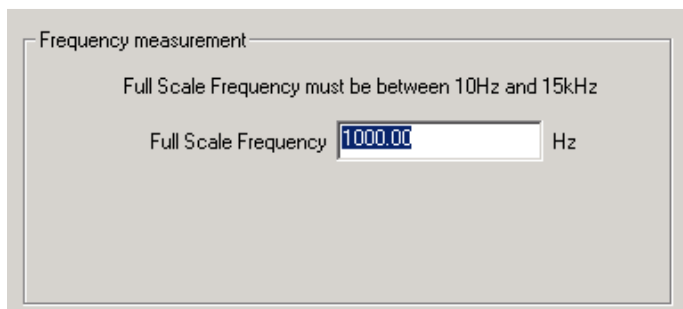
Cancel Calculate

Select if you use a drive-shaft sensor or a wheel sensor. Enter the pulses per rotation created by the sensor either as driveshaft rotation or wheel rotation. You also need to enter the wheel diameter, and in case of a drive-shaft sensor, the final drive (differential) ratio.

The LM-Programmer will calculate the pulses per mile (km) for you.

3.2.3.3 Measuring Frequency (Channel 1 and 2)

The center section of the window changes to this:




You can enter any frequency between 10 Hz and 15000 Hz as full scale frequency. In LogWorks 0 Hz is always 0 Volt, and the full-scale frequency is equivalent to 5 Volt.

3.2.3.4 Measuring Dwell (Channel 2)

Select the Dwell/ Duty Cycle function in the drop-down list on Channel 2.

3.3 Logging Data from your SSI-4 PLUS with LogWorks

1. Connect the OUT port of the SSI-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 SSI-4 PLUS.
3. Power up the SSI-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 *SSI-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:



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.

Disclaimer

INNOVATE MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO YOUR INNOVATE PRODUCT OTHER THAN THE LIMITED WARRANTY SET FORTH ABOVE. No Innovate dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty, unless enforceable or unlawful under applicable law, INNOVATE DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE, AND THE LIABILITY OF INNOVATE, IF ANY, FOR DAMAGES RELATING TO ANY ALLEGEDLY DEFECTIVE PRODUCT SHALL UNDER ANY TORT, CONTRACT, OR OTHER LEGAL THEORY BE LIMITED TO THE ACTUAL PRICE PAID FOR SUCH PRODUCT AND SHALL IN NO EVENT INCLUDE INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES OF ANY KIND EVEN IF INNOVATE IS AWARE OF THE POSSIBILITY OF SUCH DAMAGES. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.