

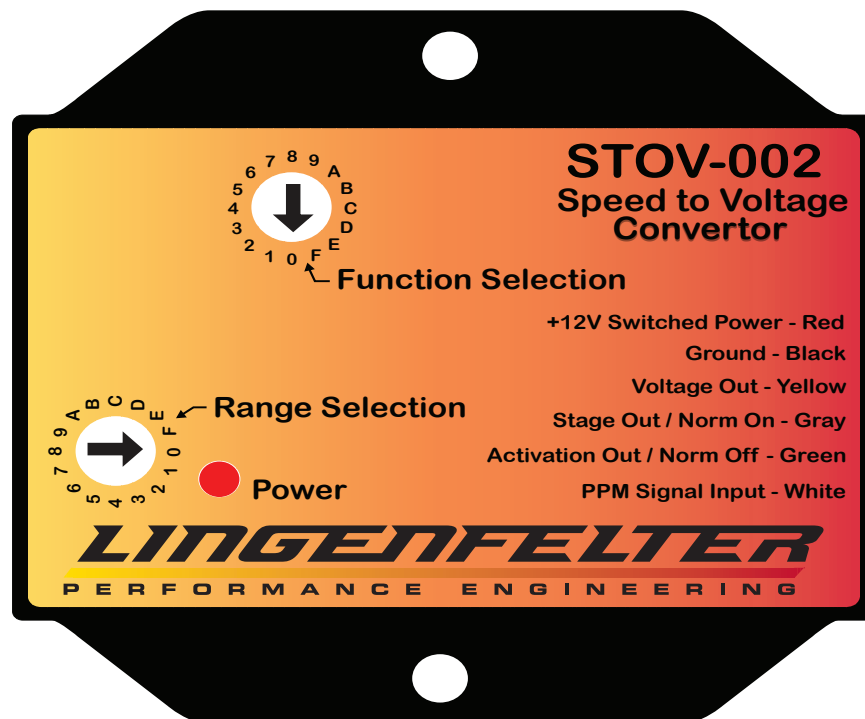
Lingenfelter STOV-002

Speed Based Relay Control Module

(vehicle speed activated switch)

&

Speed to Voltage Convertor



PN: L460050000

Parts List

#	Part number	Description
1	STOV-002	LPE MPH Activated Switch
1		hook & loop tape
2	AV16037	self-tapping screw
1	L920010000	LPE decal
1		instructions

Optional Parts List

Part Number	Description
0334680003	E38/E67 ECM pin
L450100000	Sealed 40 amp relay kit

STOV-002 basic operation description:

Input and output wires (see wiring table on page 5):

The vehicle speed input signal to the STOV is Engine Control Module (ECM) or Powertrain Control Module (PCM) pulse per mile (PPM) signal from most newer GM and other vehicles. The STOV will accept 2000, 4000, 8000 or 10,000 pulse per mile square wave 12 volt DC vehicle speed signals.

Analog voltage output is a 0-5 volt DC analog output proportional to speed. Speed range is 0 – 250 MPH (0 volts = 0 MPH, 5 volts = 250 MPH). Analog output will increase at a rate of .02 volt per MPH (linear relationship between speed and voltage). The analog voltage output function operates the same in all modes for each given frequency setting.

The analog voltage speed output can be used to feed vehicle speed to auxiliary data acquisition systems or to feed vehicle speed to devices that are not able to read the vehicle speed pulse data directly (some boost and nitrous controllers).

Two Ground active outputs. These outputs can either be simulated stage/gear position pulsed outputs or can be vehicle speed activated normally open and normally closed switched control wires.

Switches (see switch position image on page 5):

16 position Function switch to select operating mode.

16 position Range switch to select output configuration.

The STOV-002 can be used to:

- Disable the fans above a certain vehicle speed.
- Lock Torque Convertor Clutch (TCC) above a certain vehicle speed.
- Enable a second stage of boost or nitrous above a certain vehicle speed.
- Trigger a buzzer or warning light above a specific vehicle speed (Over-speed warning)
- Activate the door locks above a certain vehicle speed.
- Virtually any other device that needs to be turned on or off at a certain vehicle speed.

Specifications:

- The Lingenfelter Performance Engineering STOV-002 Speed To Voltage Convertor and MPH Activated Switch incorporates a precision 32-bit timer to realize microsecond precision over a very wide operating MPH range.
- Designed to work with most late model vehicles that have a 2000, 4000, 8000 or 10,000 pulse per mile (PPM) vehicle speed output from the ECM/PCM including:
 - 1997-2013 Corvette (C5 and C6)
 - 1998-2002 LS1 Camaro and Firebird
 - 2010-2013 Camaro
 - 2004-2006 GTO
 - 2003-2006 SSR
 - 2006-2008 Trailblazer SS and other 5.3 and 6.0L S/T trucks
 - 1999-2008 CK trucks (Tahoe, Yukon, Escalade, Sierra, Silverado)
- Fully encapsulated (potted) construction for increased durability.
- Custom molded high temperature glass filled Nylon low profile case.
- Outputs rated for up to 2.0 amps. For higher current levels, the switch should control a relay.
- Both the normally on and the normally off outputs can be used simultaneously.
- Offers the following output capabilities:
 - GM ECM/PCM vehicle speed output frequency to voltage conversion (available in all modes)
 - MPH activated switch with Normally Open and Normally Closed ground active outputs.
 - Stage/gear shift simulator for boost controllers and other devices that need to see a gear shift position switch output to change stages, such as:
 - AMS-1000 boost controller from NLR Systems
 - Innovative Turbo Systems MSBC01 Multi-Stage boost controller
- Outputs have a self protect feature and will turn OFF in case of a short or over current condition.
- Operating voltage range: 9.0 to 16.0 volts.
- Input signal type: PPM square wave 12 volt DC.
- Input signal impedance: 15k Ohm.
- Current draw: less than 0.1 amp plus current draw of device being controlled (when active).
- Warranty: 90 days from date of purchase.

Stage/gear simulator Function output control mode (Function switch setting 0, 4, 8 or C depending on PPM output):

This mode is used to provide a stage/gear shift simulated output for boost controllers and other devices that need to see a gear shift position switch output to change stages, such as:

- AMS-1000 boost controller from NLR Systems
- Innovative Turbo Systems MSBC01 Multi-Stage boost controller

Operation as MPH increases - When the 1st table entry is reached the green wire “Activation” output will turn on (provides a ground signal), starting Stage1 boost control. This output will remain ON until MPH drops below 1st table entry.

As MPH increases and becomes greater than or equal to next table entry the gray wire “Next Stage” output will turn ON (provides ground signal) for .1 second then turns back OFF. This provides pulse to increment the boost controller to the next stage. This process continues as MPH increases until the last table entry is reached and/or a table entry is equal to 0.

As the MPH decreases the “Activation” output will remain ON until MPH is below 1st table entry. Then the “Activation” output turns OFF resetting the sequence (and in most systems, resetting your nitrous or boost controller). If MPH increases the above sequence is performed again.

The settings for this mode are shown in Table A on page 6.

Vehicle speed switch Function control mode (Function switch settings 1, 2, 3 or 5, 6, 7 or 9, A, B or D, E, F):

In this mode the STOV is a vehicle speed based switch, enabling and disabling the normally closed and normally open switched outputs much like an RPM activated switch does based on engine speed.

For each PPM setting (2000, 4000, 8000 or 10,000), the STOV provides three different vehicle speed range settings. The first mode provides a low speed range/high resolution signal of 0 to 15 mph in 1 mph increments. The other two modes provide a standard and high speed range mode in a coarser 10 mph increment (10 to 150 mph range and a 110 to 250 mph).

When vehicle speed exceeds the value set in Table B with the Function and Range switches, the Normally Open (NO or OFF) activation wire connects to ground and the Normally Closed (NC or ON) wire will open the ground path (was connected to ground before activation).

When the vehicle speed drops one MPH below the MPH set point, the process reverses itself and the Normally Open (NO or OFF) activation wire will open the ground path and the Normally Closed (NC or ON) wire will connect to ground (i.e. 1 MPH hysteresis).

The switch settings for this mode are shown in Table B on page 6.

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Vehicle speed to voltage conversion function (any Function switch setting):

Analog voltage output is a 0-5 volt DC analog output proportional to speed. Speed range is 0 – 250 MPH (0 volts = 0 MPH, 5 volts = 250 MPH). Analog output will increase at a rate of .02 volt per MPH (linear relationship between speed and voltage).

The vehicle speed to output voltage ratio/step size is the same in all modes but since different makes and models of vehicles output different pulse per mile frequencies for a given vehicle speed, the PPM (or frequency) to voltage output can be changed to between four different of the most common PPM ranges. These settings are 2000, 4000, 8000 and 10,000 PPM.

Most newer GM vehicles output 4000 PPM from the ECM so for these vehicles you would want to use the Function switch setting 4, 5, 6 or 7 (depending on what feature you want). The 2005-2006 Pontiac GTO (E40 ECM) outputs 10,000 PPM so for these vehicles you would want to use Function switch setting C, D, E or F.

The 0-5 volt Analog and Switched outputs will work simultaneously and either and/or both may be used at the same time. The ECM/PCM Vehicle Speed Signal (VSS) must be calibrated correctly for this output to be accurate.

Function switch settings for PPM input signal			
Function switch		PPM	Mode
0	0	2000	Gear change simulation
1	1	2000	Table B low speed range
2	2	2000	Table B standard speed range
3	3	2000	Table B high speed range
4	4	4000	Gear change simulation
5	5	4000	Table B low speed range
6	6	4000	Table B standard speed range
7	7	4000	Table B high speed range
8	8	8000	Gear change simulation
9	9	8000	Table B low speed range
A	10	8000	Table B standard speed range
B	11	8000	Table B high speed range
C	12	10000	Gear change simulation
D	13	10000	Table B low speed range
E	14	10000	Table B standard speed range
F	15	10000	Table B high speed range

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See the table below for the Function switch settings in each PPM range.

Wiring (also labeled on module):

Wire Color	Label	Notes
Red	+12V Switched Power	Connects to a switched +12 volt source.
Black	Ground	Connects to a vehicle ground.
Yellow	Voltage Out	This is the vehicle speed output voltage (analog voltage output). This is a 0-5 volt DC output.
Gray	Stage Out / Norm On	This is the first of two output wires. When used in MPH activated switch mode, this wire connects to the ground side of the device you plan to activate. When used in gear mode, this wire activates the boost controller's next stage.
Green	Activation Out / Norm Off	This is the second output wire. When used in MPH activated switch mode, this connects to the ground side of the device you plan to activate. When used in gear mode, this wire activates and deactivates boost control.
White	PPM Input Signal (VSS)	This is the vehicle speed pulse input. This connects to the ECM/PCM Vehicle Speed Sensor (VSS) output signal.

Red LED:

- Solid red when powered up.
- Blinks whenever target MPH is reached.

Installation:

- Remove negative battery terminal.
- Connect black wire of MPH switch to a suitable vehicle ground.
- Connect the red wire to a **switched and fused** +12 volt DC source.
- Connect the white wire to the ECM or PCM speed signal output wire (consult service information or contact LPE for your specific vehicle application).
 - See Table C on page 10 for sample PCM/ECM vehicle speed output pin/wire locations.
 - If there is no wire in your vehicle speed output pin/wire location, you will need to enable the VSS signal by re-calibrating the ECM, add a wire to the connector, and then add a pull-up resistor to the circuit (See page 11 for pull-up resistor wiring instructions).
- Connect the output/control wires (green and gray) as needed for your application.
 - See page 8 for example wiring schematics for MPH switch function.
 - See page 9 for example wiring schematics for use with the LPE LNC-001R / LNC-002 / LNC-003 / LNC-2000 launch controllers.
- Reconnect the negative battery terminal.

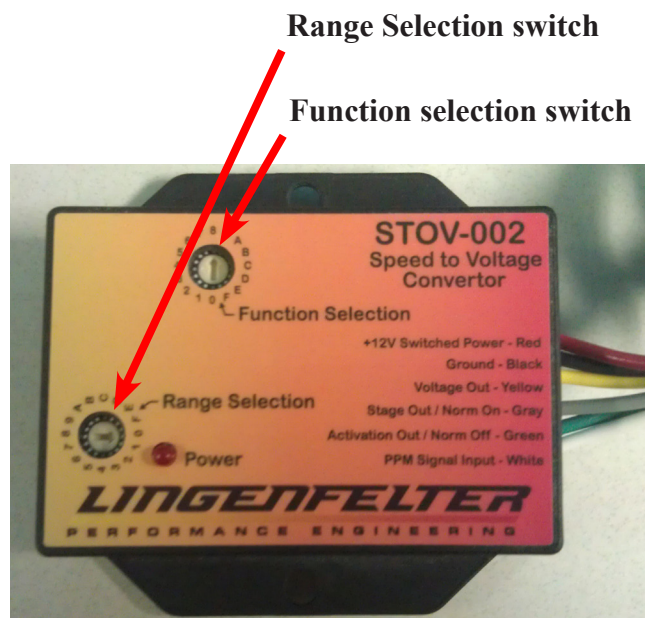


Table A							
Speed (MPH)		Gear Change					
		1	2	3	4	5	
Range Switch Position	0	0	30	60	110	140	175
	1	1	25	50	95	125	155
	2	2	20	45	90	115	140
	3	3	20	40	80	105	130
	4	4	40	75	120	175	220
	5	5	35	70	115	170	210
	6	6	30	65	105	150	200
	7	7	55	80	110	140	190
	8	8	50	75	100	130	175
	9	9	45	70	95	125	165
	10	A	40	65	90	120	160
	11	B	47	80	123	164	200
	12	C	44	75	116	154	190
	13	D	38	65	100	133	180
	14	E	35	60	92	122	166
	15	F	32	55	85	113	152

Table B				
Switch Position		Speed in MPH (mode)		
		Low (1)	Std (2)	High (3)
Range Switch Position	0	OFF	OFF	OFF
	1	1	10	110
	2	2	20	120
	3	3	30	130
	4	4	40	140
	5	5	50	150
	6	6	60	160
	7	7	70	170
	8	8	80	180
	9	9	90	190
	A	10	100	200
	B	11	110	210
	C	12	120	220
	D	13	130	230
	E	14	140	240
	F	15	150	250

Settings:

- Controlled by two (2) sixteen (16) position switches (as labeled on page 3 and on the module itself).
 - One switch is for selecting the Function. The following functions (modes) exist at this time:
 - The first switch setting in each PPM group (setting 0, 4, 8 or C) enables the gear change simulation function (Table A).
 - The second switch setting in each PPM group (setting 1, 5, 9, or D) enables the low speed range (Table B, Low (1)) MPH activated switch function.
 - The third switch setting in each PPM group (setting 2, 6, A or E) enables the standard speed range (Table B, Std (2)) MPH output switch function.
 - The fourth switch setting in each PPM group (setting 3, 7, B or F) enables the high speed range (Table B, High (3)) MPH output switch function.
 - Second switch is for selecting the Range (within table A or B)

Notes:

- **Changes to the MPH switch point settings must be done with the STOV powered off.**
 - The switch positions are only read on start up

STOV-002 to AMS-1000 boost controller:

The Stage input for the AMS-1000 can be configured for either ground or +12v. It can be pulsed input or an analog voltage input.

To connect the STOV-002 to the AMS-1000 we recommend using analog voltage input setting and the analog voltage output from our MPH switch (Yellow voltage out wire).

The voltage out data from the STOV-002 is not modified by any of the switch settings. The pulse per mile signal into the STOV-002 from your ECM or other device needs to be calibrated correctly. If this data is correct, then the voltage output from the STOV-002 will also be correct. Analog voltage output is 0-5 volt analog output proportional to speed. Speed range is 0 – 250 MPH (0 volts = 0 MPH, 5 volts = 250 MPH). Analog output will increase at a rate of .02 volt per MPH (linear relationship between speed and voltage). The analog voltage output function operates the same in all modes.

If your input signal into the STOV-002 is not calibrated correctly you can scale the STOV-002 signal to make the readings still work in the AMS-1000. You can easily check to see if the STOV-002 signal is calibrated correctly using a volt meter on the yellow signal output wire.

In order to cover a wide voltage range in analog mode all 6 stages need to be turned on. Even if the user sets 5 of the same boost level. Each stage has a +/-V adjustable setting. The AMS-1000 can be programmed to not activate until 1.5 volts for the first stage if desired. If the vehicle will never see 255mph then the maximum speed can be used to determine the working voltage range. The range/gap is adjustable for each stage.

For example

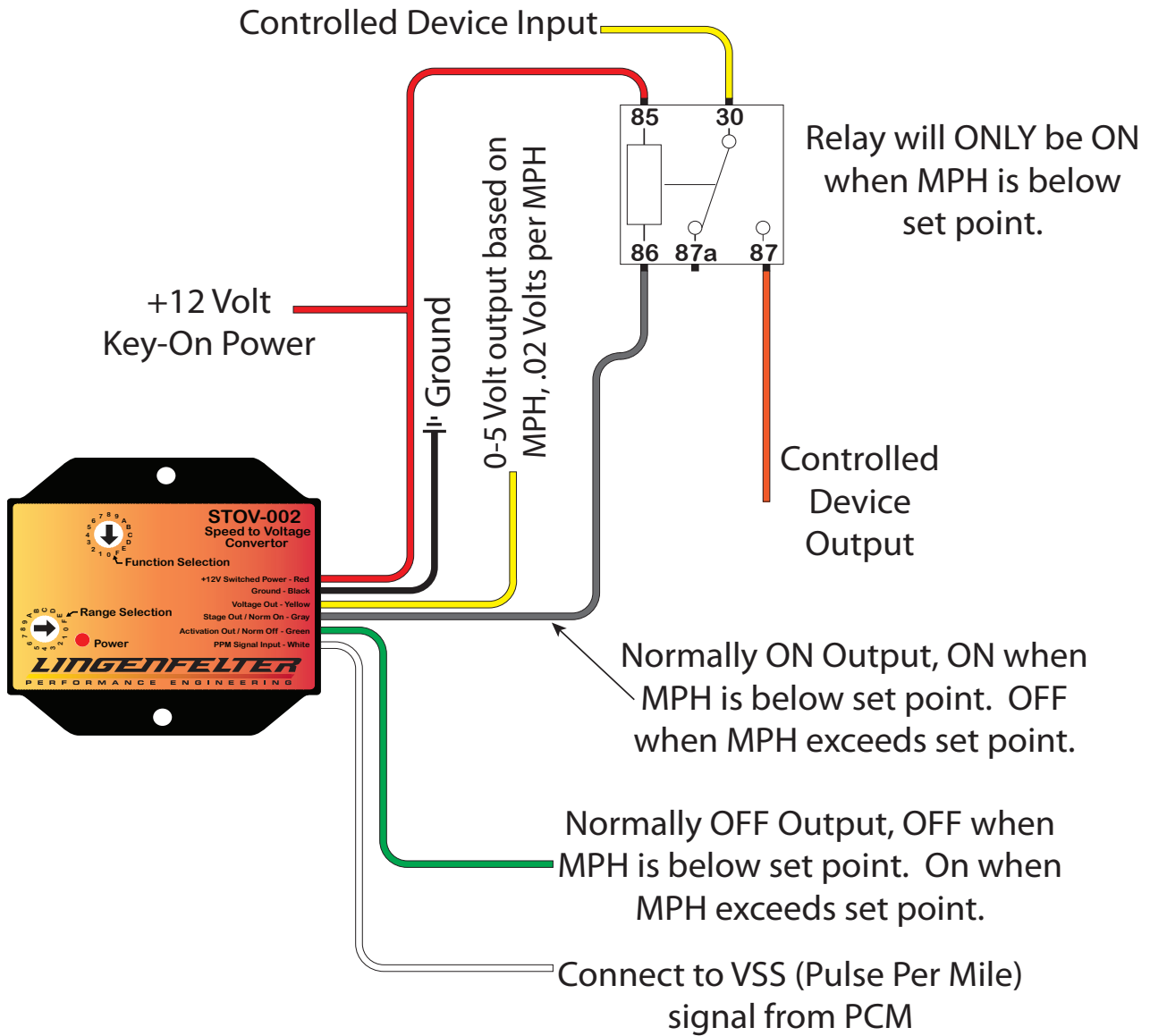
- Stage 1 = Target Voltage = .5 v, range +/- .4v
- Stage 2 = Target voltage = 1.3v, range +/- .4v
- Stage 3 = Target voltage = 2.1v, range +/- .4v
- Stage 4 = Target voltage = 2.9v, range +/- .4v
- Stage 5 = Target voltage = 3.7v, range +/- .4v

So in the example ranges provided above the stage entry speeds would be 5 mph, 45 mph, 85 mph, 125 mph, 165 mph and 205 mph (see table below).

		Input Values		Calculated Values				
		Target	Range	Min	Max	MPH		
Stage	1	0.5	0.4	0.1	0.9	25	5	45
	2	1.3	0.4	0.9	1.7	65	45	85
	3	2.1	0.4	1.7	2.5	105	85	125
	4	2.9	0.4	2.5	3.3	145	125	165
	5	3.7	0.4	3.3	4.1	185	165	205
	6	4.5	0.4	4.1	4.9	225	205	245

If the voltage does not fall within a programmed range for a stage the activation turns off.

Signal Disable Installation, Function Switch Set to Position 1 (Example- Fan Relay Control)



1998-2002 F-Body and 1997-2008 Corvette Factory Clutch Switch Diagram with the STOV-002 and LNC-2000 Modules

In this configuration, the STOV-002 is being used to only allow a 2-step controller to be active at the line. Once the vehicle is moving, the STOV-002 switches the relay, disabling the 2-step controller. Set the MPH switch point to a speed below your first gear shift point.

- 1 - Locate CPP (Clutch Position Switch) and unplug 2-wire connector.
- 2 - Cut wires approx. 3" back from connector.
- 3 - Find +12 volt Key On power source and connect to one wire of CPP connector.
- 4 - Splice two wires onto remaining CPP connector wire and connect one wire to #85 on Relay. The extra wire will be used for LNC-2000 Launch Controller activation.
- 5 - Connect terminal #86 on Relay to Ground.
- 6 - Connect wires cut from CPP Switch connector to Terminals #30 and #87 as shown.

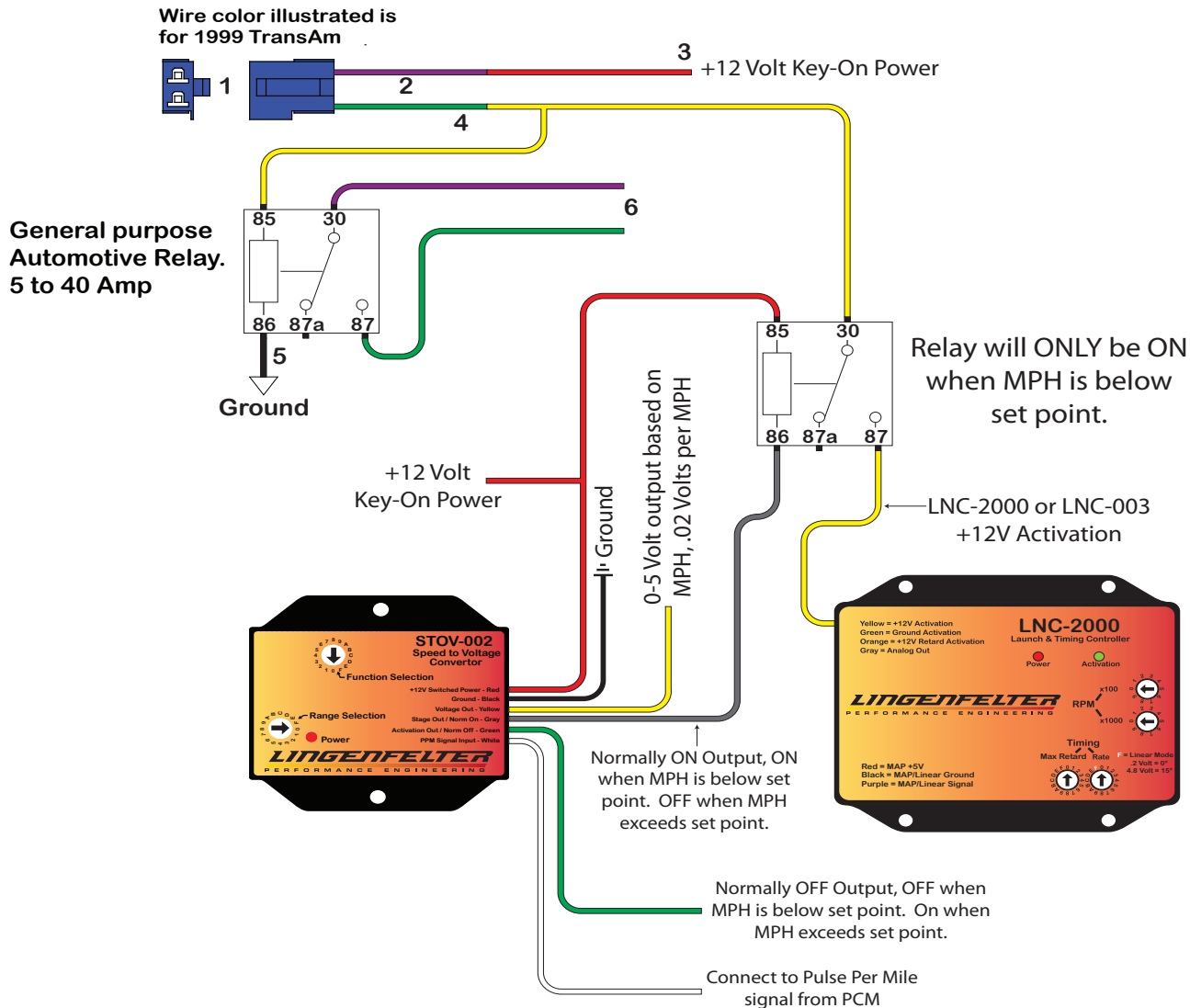


Table C

ECM/PCM Speed Output Information for Common GM Vehicles

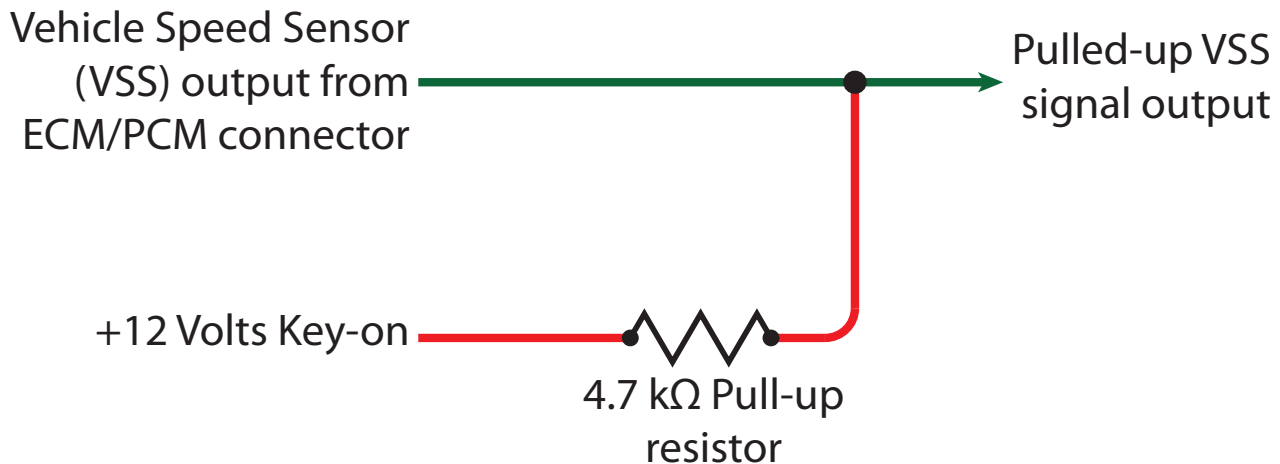
Vehicle	Year	ECM/PCM Connector	Pin	Wire Color	Circuit Number
Camaro/Firebird	1996-1997	C2 (Black)	8	Dark Green/White	817
Camaro/Firebird	1998	C1 (Red)	55	Dark Green/White	817
Camaro/Firebird	1999-2002	C2 (Red)	50	Dark Green/White	817
Camaro	2010-2013	C1 (Black)	57	N/A	N/A
CK Truck	1999-2002	C2 (Red)	50	Dark Green/White	817
CK Truck	2003-2006	C2 (Green)	50	Dark Green/White	817
CK Truck	2007-2008*	C1/X1 (Black)	57	Yellow/Black	1827
CK Truck	2009-2012	C1 (Black)	57	N/A	N/A
Corvette	1996	C2 (Black)	8	Dark Green/White	817
Corvette	1997-1998	C1 (Red)	55	Dark Green/White	817
Corvette	1999-2003	C2 (Red)	50	Dark Green/White	817
Corvette	2004	C2 (Green)	50	Dark Green/White	817
Corvette	2005	C1 (Blue)	21	Dark Green/White	817
Corvette (Except ZR1)	2006-2013	C1/X1 (Black)	57	Dark Green/White	817
Corvette ZR1	2009-2013	X1 (Blue)	39	Dark Green/White	817
CTS-V	2004-2005	C2 (Green)	50	Brown	818
CTS-V	2006-2007	C1 (Blue)	39	Brown	818
CTS-V	2009-2012	C1 (Blue)	39	N/A	N/A
GTO	2004	C2 (Green)	50	Purple/White	5197
GTO	2005-2006	C1 (Blue)	21	Purple/White	5197
SSR	2003-2004	C2 (Green)	50	Dark Green/White	817
SSR	2005-2006	C1 (Blue)	21	Dark Green/White	817
Trailblazer SS	2006	C1 (Blue)	21	Dark Green/White	817
Trailblazer SS	2007-2008	C1/X1 (Blue)	39	Dark Green/White	817

* For the 2007-2008 CK Trucks, pin 57 on the PCM/ECM connector may or may not be populated by the wire listed above. If the pin position on the connector is not populated, the vehicle speed is being relayed via CAN Bus. Refer to the instructions on the next page to receive the vehicle speed signal for vehicles that deliver the signal via CAN Bus.

Retrieving VSS signal from vehicles that use CAN Bus:

If the vehicle does not relay the VSS signal through the ECM/PCM connector (i.e. 2007-present CK Truck*, 2010-present Camaro, 2009-present CTS-V, etc...), you must enable the VSS signal in the ECM/PCM, add a pin to the connector harness, and add a pull-up resistor. Most applications will require a pull-up resistor rated anywhere from 1-10 k Ω . LPE recommends using a 4.7 k Ω pull-up resistor, but keep in mind that a different pull-up resistor may be required for your application

Wiring a Pull-Up resistor into the Vehicle Speed Sensor (VSS) Signal Circuit



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P E R F O R M A N C E E N G I N E E R I N G

For additional product installation information and technical support, contact LPE or your LPE products distributor. You can also find technical support and usage discussions regarding this product and many other LPE products in our Internet forums:

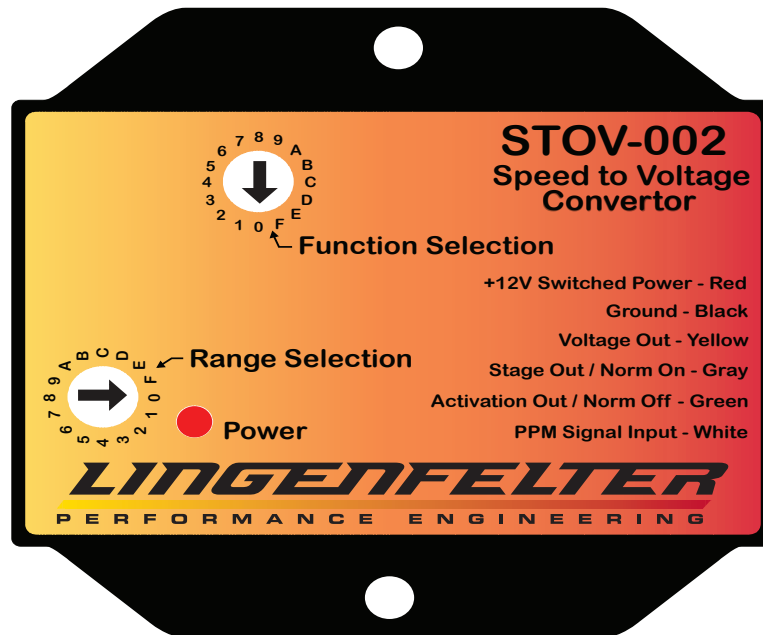
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Limited Warranty:

LPE warrants the Lingenfelter STOV-002 Speed Based Relay Control Module to be free from defects in material and workmanship under normal use and if properly installed for a period of 90 days from the date of purchase. If the module is found to be defective as mentioned above, it will be replaced or repaired if returned prepaid along with proof of date of purchase. This shall constitute the sole remedy of the purchaser and the sole liability of LPE. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representations whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall LPE be liable for special or consequential damages.



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