

# **Gen V LT1/LT4/LT5 and L83/84, L86/87 installation guide**

by David White

www.automobileman.com - rev P. - 03/01/2023- (206) 999-8138 (text OK)

This is a brief and concise guide to those who are interested in installing the new generation of LT engines offered by GM Performance. A lot has changed in the last 6 years since I started, much of what I've already written may be out of date, but I still add revisions on a regular basis. This guide is also useful for take-outs or engine swaps from donor vehicles from wrecking yards. ***Please read the last section regarding using a conventional LS style fuel pump and filter.***

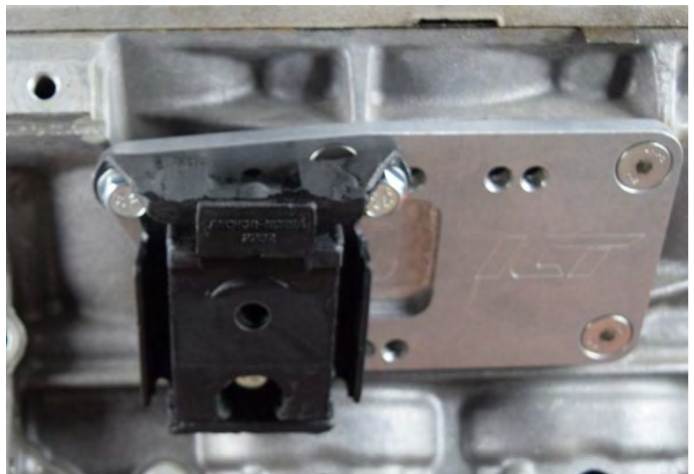
## **Engine mounting plates**

The LT block shares little with the previous generation of LS engines and requires a unique set of engine mounting plates. I used a pair of sliding engine mounts from [Dirty Dingo](#) called LT adjustable conversion mounts. They list for \$154.95



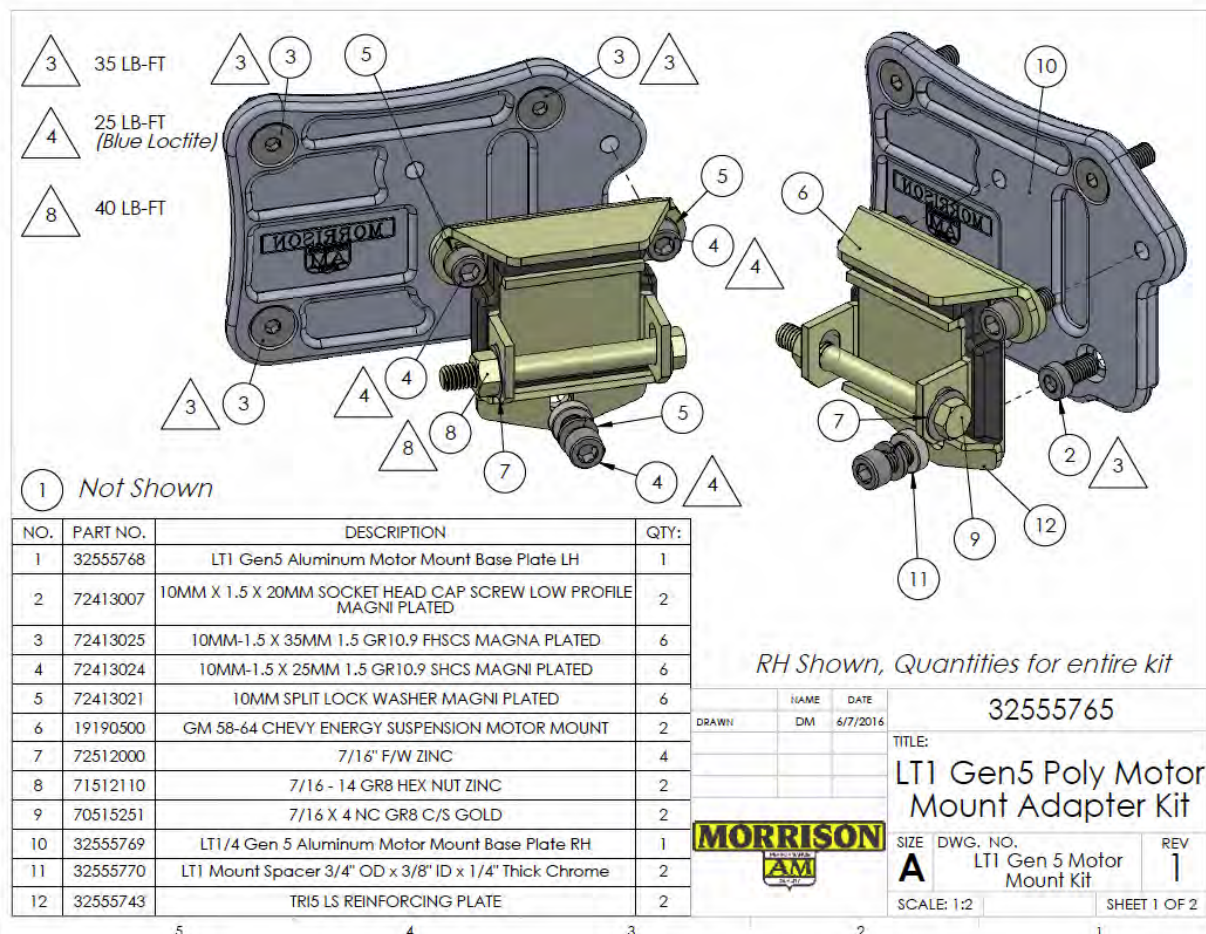
They also make a [single mounting bracket with four adjustable holes](#) that runs \$69.95.

[ICT Billet also makes an LT engine swap bracket](#) that retails for \$64.95



Both systems use conventional small black Chevy Gen 1 engine mounting pads that will adapt to existing engine mounting locations in classic cars such as Belairs, Chevelles, Novas and Camaros. The stock engine cradle may be a problem with a stock pan, especially if you want to mount a low driver's side alternator.

**Art Morrison** has released their LT motor mounting plates – Poly is \$285 and rubber is \$240.



## LSX Innovations



These plates will not work with low mount AC compressors, or factory truck LT vacuum pumps. GM Part number 1154665 will be required to block the oil passages for the vacuum pump If your engine came equipped with one from the factory, two of these are required to block the passages. \$60.00 for the plates on the left and \$80 for the adjustable weld on type. [www.lsxinnovations.com](http://www.lsxinnovations.com)



## Engine Pan

Since both engines are available in dry sump or wet sump you must anticipate and design where your oil reservoir will be if you are going with the dry sump version. I went with the wet sump version and had to modify my sump by [cutting 1" off the front of the sump](#), but Moroso has a pan that should solve most of the subframe issues.

[Moroso part # 20155](#)



Holley produces their Gen V swap pan under [part number 302-20](#).



GM's new Gen V LT direct injected engines are starting to find their way into a large variety of vehicles. They make great power, plus they're very durable and reliable. Unfortunately, the factory oil pans don't always fit correctly or they hang too low for today's hot rods. Holley's new LT Retro-fit Engine Oil Pan is designed to help! It provides maximum clearance to the chassis and ground, plus provides an OEM fitment for durability and proper sealing. These oil pans are perfect for:

'74 Nova/Apollo/Ventura/Omega, 1978-'87 G-body, 1964-'72 A-body, and 1973-'87 Chevy/GMC Full Size Trucks

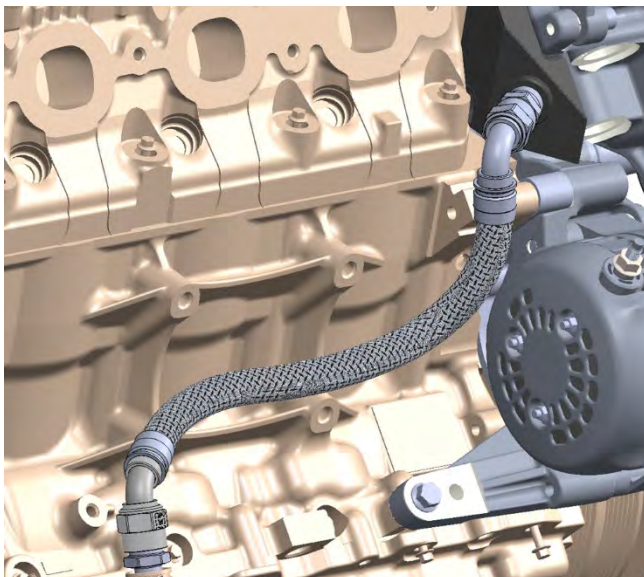
## **Features:**

- Designed for LT Engine Retro-Fit Installations in Classic Car and Truck Chassis Requiring More Oil Pan to Chassis Clearance Around the Front Half of the Oil Pan
- Allows for up to 4.00" Crankshaft Stroke
- Can Be Used Anywhere a GM F-Body Oil Pan Can Be Used

- Provides OEM fitment - Oil filter mounting, OEM Engine NVH Suppression, OEM Flange Sealing, Proper Structural Rigidity and OEM Bell-Housing Attachments.
- Traditional High-Quality Cast Aluminum Appearance With Clean Exterior Styling
- Provides Maximum Clearance for Vehicles Where the Steering Linkage is Behind the Engine cross-member
- Traditional high-quality cast aluminum appearance with clean exterior styling.
- Provides maximum clearance for vehicles where the steering linkage is behind the engine crossmember.
- Cast and machined aluminum
- Oil Cooler Port Provision
- 1/2" NPT port – Ideal for Turbo Oil Return or PCV Oil Return
- Hinge Door Baffles Available
- Complete Kit Includes: Windage Tray, Sump Baffle, OE Style Pick-Up Tube, Sump Port Plug, Oil Filter Stud, Billet Oil Passage Cover, etc

Both the LT1 and the LT4 have a pan mounted oil oiler on the driver side that will interfere with most crossmembers. This can easily be eliminated when using the Holley 302-20 swap pan or you can modify the existing pan as shown here. I simply welded in cut-off AN 12 fittings and used those as ports to direct the engine oil to an externally mounted conventional oil cooler.

Here's a drawing for the oil/air separator sump (PCV) return line from Holley from their LT4 serpentine belt system. There have been numerous posts (2016) that identifies a cooling issue with LT4 engines that are used on the track and pushed hard (*GM has since added up to 13 intercoolers*).



Once the oil temperature reaches 280 degrees the engine will shut down and run in ***“limp mode.”*** The 2017 Z06 and the ZL1 Camaro have improved cooling designs that will help with this problem. See the section on **Supercharger Intercooler** for more details. The best solution is to remove the entire pan and replace it with the Holley 302-20 as referenced above.

## **Hydraulic Power Steering**

Holley has their Modular Gen V LT1/LT4/LT5 accessory drive kits and they are by far the best design and most



comprehensive solution that's available. They really put a lot of effort into this swap kit and it really shows. Make sure you look at or read their [installation guide](#). For the full selection of options visit their website: [https://www.holley.com/products/ls\\_power/ls\\_and\\_lt\\_accessory\\_drives/mid\\_mount/complete\\_accessory\\_kits/](https://www.holley.com/products/ls_power/ls_and_lt_accessory_drives/mid_mount/complete_accessory_kits/)

**Holley**

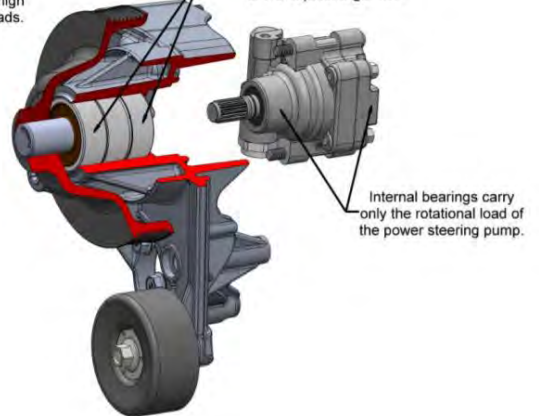


**Design Benefits Explained:**

Splined bearing drive system eliminates pump bearing failure from high supercharger belt loads.

Large dual ball bearing assembly carries all side load of the supercharger belt.

Internal bearings carry only the rotational load of the power steering pump.



GM



Not only does the Holley's accessory drive add a reliable power steering solution, it also pulls in accessories tighter than other drives allowing clearance for steering boxes, suspension, and frame rails in swap applications.

(GM wet-sump accessory drive and water pump silhouette shown in red).

announced a LT1 and LT4 Power Steering Kit P/N 19417241 (LT1) and P/N 19417242 (LT4) that is priced around \$1,600 and is one way to achieve power steering on these engines.



The new **L83/L84** and **L86/87** truck engines are also available and make great swap candidates. All American Billet has a remarkably simple solution for their power steering conversion (**PSBL83**). They reference GEN V so they may work on LT1 applications. [www.allamericanbillet.com](http://www.allamericanbillet.com)







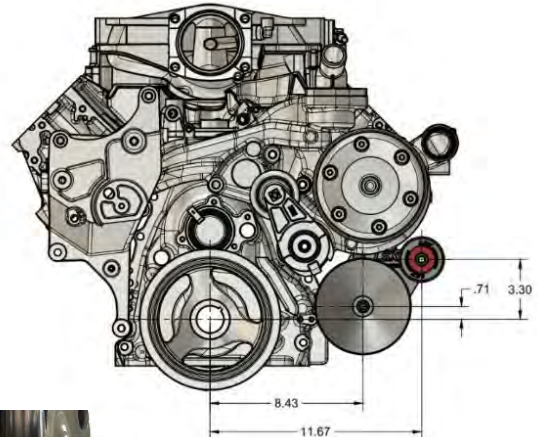
You now have an easy solution for adding a KRC PS3 power steering pump to your swap with this All American Billet bracket. Made from 6061-T6 aluminum and includes stainless steel mounting hardware \$120.00

This takes the place of the stock vacuum assist pump on the L83/84. **American Billet** also produces a complete LT4 serpentine system that starts at \$2,095.00

### LSX Innovations ([www.lsxinnovations.com](http://www.lsxinnovations.com))

This system solves tight fit to engine clearance issues associated with other systems. Designed to be used on Truck L83 and L86 engines only, requires the use of a remote power steering reservoir. Uses stock L83/L86 water pump, tensioner, and balancer. Uses 1997-2002 Corvette power steering pump, and Dorman 300-301 Power steering pulley only. \$119.95

Made in the USA from Aircraft grade Billet aluminum. Not compatible with factory vacuum pumps. Includes vacuum pump delete plate.



Here's the latest from **Billet Specialties: All**



GM's Gen V LT1 has an excellent pedigree and high-tech features that bring reliable horsepower to your application. Billet Specialties LT1 Tru Trac is engineered to allow hassle-free installation into classic muscle cars while providing a stable and reliable engine accessory drive that just happens to look great! Dyno testing ensures perfect alignment, proper accessory RPMs, and optimal performance of all components. With over 15 years' experience manufacturing front engine accessory drives with the best brands in aftermarket components, there is a reason Billet Specialties Tru Tracs are the choice of the nation's top builders. Also available for LT4.



*(The following was written before the above products were available).* This is a big problem since all the automobiles that are produced now use electric power steering, both engines have no provision for hydraulic power steering.





In 2015 I saw the 1970 GM SEMA Camaro and thought I could copy and use the system the factory used to plumb in a GM type II power steering pump into the serpentine belt system. This was not easy, it took a considerable amount of time, but if you know how to engineer and fabricate it's that bad.



The hydraulic power steering pulley simply replaces the idler pulley that was there. It is a standard GM type II pump that was sourced from Detroit Speed. I used a 2007 Dodge RAM power steering pulley that is slightly undersized from stock. The factory actually took a stock 6 rib

pulley, split it apart and welded two halves together and then re-machined it because GM does not manufacture an 8 rib pulley that will fit the Type II pump.



**Eddie Motorsports** manufactures a power steering conversion for the LT1. [www.eddiemotorsports.com](http://www.eddiemotorsports.com)



The kit works in conjunction with the stock LT1 Front Engine Accessory Drive and comes complete with a GM Type II power steering pump, all necessary billet aluminum brackets and pulleys, stainless steel fasteners, and a belt.

The kit requires the use of an ATI Racing #917314 (or equivalent) six rib damper (sold separately). MS107-19 with attached plastic P/S reservoir MS107-19B with attached billet aluminum P/S

reservoir MS107-19R with P/S pump for remote reservoir MS100-18 ATI Racing Damper. Prices start at under \$500.00

#### **LT1 Gen V Air Conditioning Kit**

The kit works in conjunction with the stock LT1 Front Engine Accessory Drive and gives you everything you need to install a compact Sanden SD7 air conditioning compressor for use with aftermarket air conditioning applications. The complete kit comes with a new compressor, all necessary billet aluminum brackets, compressor manifold, pulley cover, and stainless-steel fasteners. MS107-98M Machined MS107-98P Polished MS107-98XX Specify Color



Dirty Dingo also manufactures a [power steering pump conversion for the LT1](#) and they run \$469.99





**Drive Junky** offers complete systems for all Gen V engines including L83/86, they start at \$1,500  
[www.drivejunky.com](http://www.drivejunky.com).

Theirs is the only one that separates the power steering pump from the 8 rib pulley that powers the supercharger.





**ICT Billet** (ictbillet.com) offers a complete line of power steering, AC and high/ low mount options starting at \$150.



## Headers

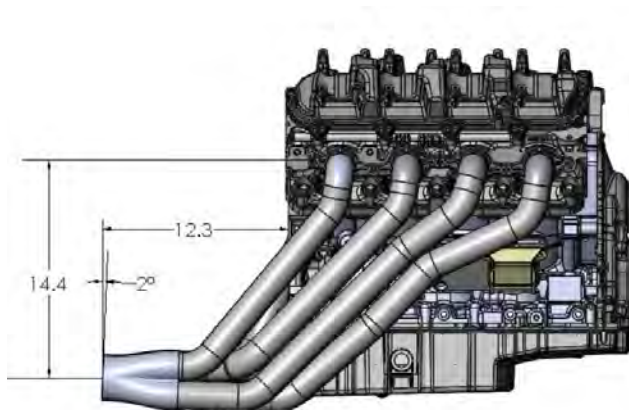
The stock header system on both the LT1/LT4 are a stainless-steel shorty type and will work most of the time.



Sometimes you can find these from wrecking yards or on Ebay for a good price.

For the best on the market look at Ultimate Headers. [www.ultimateheaders.com](http://www.ultimateheaders.com)





These headers include the unique features of all Ultimate Headers products – strong and stylish cast 316L grade Stainless Steel flanges, investment cast elbows for tight clearances – to deliver performance in a very compact package. Plus, you get a complete package – headers, ARP 12-point Stainless Steel header bolts, a pair of matching Cometic HTS header and HTS Collector Gaskets (if applicable).

Other options are Holley Blackheart Shorty SS or Longtube headers. 70101325-RHKR or 70301304-RHKR



For an inexpensive solution try Speed Engineering on Ebay, they offer both short & full length. Also sold by ICT Billet.



## **Wiring and controller system**

If you have not rewired a classic car for an LS or the LT series of engines, things have changed considerably since the 50's and 60's. The controller system (GM Performance) that comes with these engines includes a complete fuse panel and ECM (that controls every function of the engine. In the LS series of engines the ECM is relatively easy to mount because it's not that large, but in the LT engines it's large, about the size of an iPad.



My biggest issue was trying to find a place for it because it simply did not fit anywhere. GM buries these ECMs deep within modern cars and it's a challenge just to find where they put them. I chose to mount it as shown and modified my heater box, but I would not recommend it. Instead, I should have installed a Vintage Air System (which I'm doing now) and completely removed the existing heater system, then you end up with a simple cover plate that goes over where the old heater box used to be. It is much cleaner and a simpler way to go, plus it gives you plenty of room to install this massive ECM (see picture below). Look at the Blue

GM 1970 Camaro and you can see the factory mounted the ECM horizontally.

The fuse box is just like the LS3 and includes all the fuses and relays to run the engine and additional electrical demand, plus it controls the fuel pump and the dual fan relays. The GM Performance crate relay provides discrete fan control, not PWM (Pulse Width Modulated) control. You only need to hook up one wire (ignition - pink) to your existing system to get things going.

## **Donor or take-outs from wrecking yards**

With the proliferation of L83/L86 truck engines there are a lot of options from junkyards. Most yards simply take apart the vehicles and stock the parts on their shelves. A few of them (Check Ebay listings under "Complete Engines") understand the market and will provide you a complete drivetrain assembly with the wiring harness





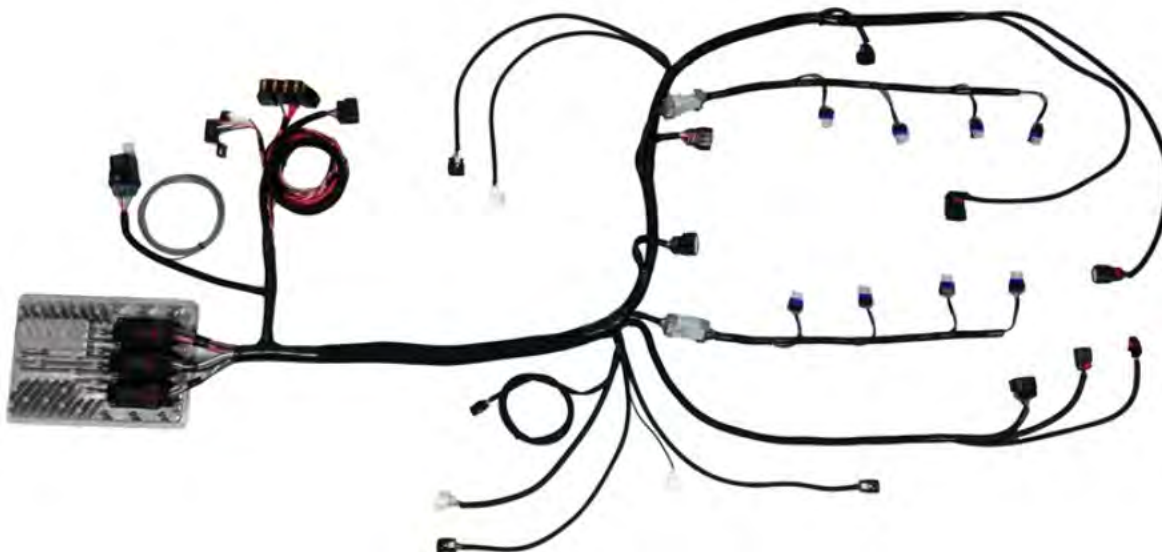
and ECU intact. ***Make sure that you get the original harness that came with the engine, including the harness, all sensors, O2 bung and sensor, MAF, throttle pedal, trans yoke, throttle body and the ECM/TCU that came from the donor car. These are a matched set from the factory including the transmission, do not mix and match years or they will run in limp mode and cause issues. Both the ECU/TCU are VIN coded and must be from the original engine. Since 1968 GM has included the last 8 digits of the VIN on the engine block.***



1K\*CG265457 (shown on the left) is actually 3GCUKSEC9JG265457. GM Performance and Powertrain can provide you the real VIN based off the last 8 digits. Most VIN search engines require the full 17 digits to work. You can reflash your ECU to a correct VIN based OS if it's incorrect. T87a TCU's can be flashed, but not tuned because they are encrypted. HP Tuners can unlock the T87a and reflash them, but it's around \$400.

Changes to the high-pressure fuel pressure sensor in 2017 have made upward and downward compatibility of these systems not possible without changes to the harness, sensors, or ECM. There are many companies who offer harness reworks, new harnesses or ECM tuning. Check out the Muscle Car module from [www.swaptimeusa.com](http://www.swaptimeusa.com) for the latest in a complete harness that include NSS, Tap shift and PWM fan control.

Just like the LS engines you will need to delete the VATS (Vehicle Anti-Theft) and remove the second O2 sensor information for emissions. This is relatively easy if you have HP Tuners or EFI Live. Some Dyno shops can perform this, but if you don't have anyone local consider standalone systems from either Speartech – [www.speartech.com](http://www.speartech.com), Howell EFI [www.howellEFI.com](http://www.howellEFI.com), [standaloneharness.com](http://standaloneharness.com), [psiconversion.com](http://psiconversion.com), [currentperformance.com](http://currentperformance.com), [swaptimeusa.com](http://swaptimeusa.com) and others. You can also buy the standalone harness ECU systems that come standard on the Connect n Cruise systems from GM and use them on pullout drivetrains.



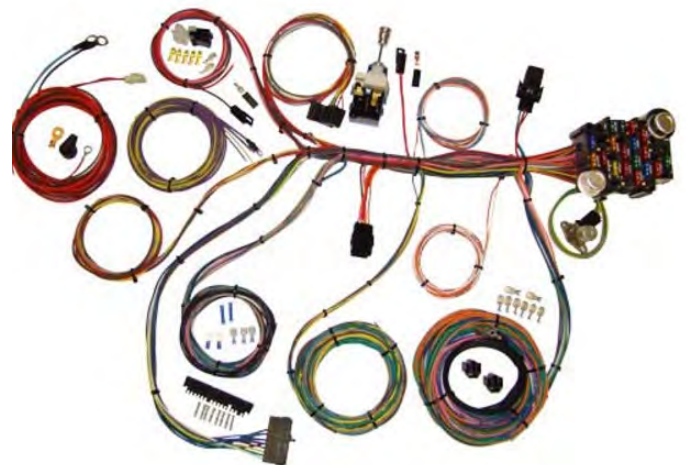
I've also used Wayne Hartwig's harnesses from [150tunes.com](http://150tunes.com). [They build complete harness starting from \\$600.00 and can also provide tuning.](#)

I view the harness and wiring as four (4) distinct subsystems that connect and pass information in a loop (CANBUS) to the ECU/TCU.

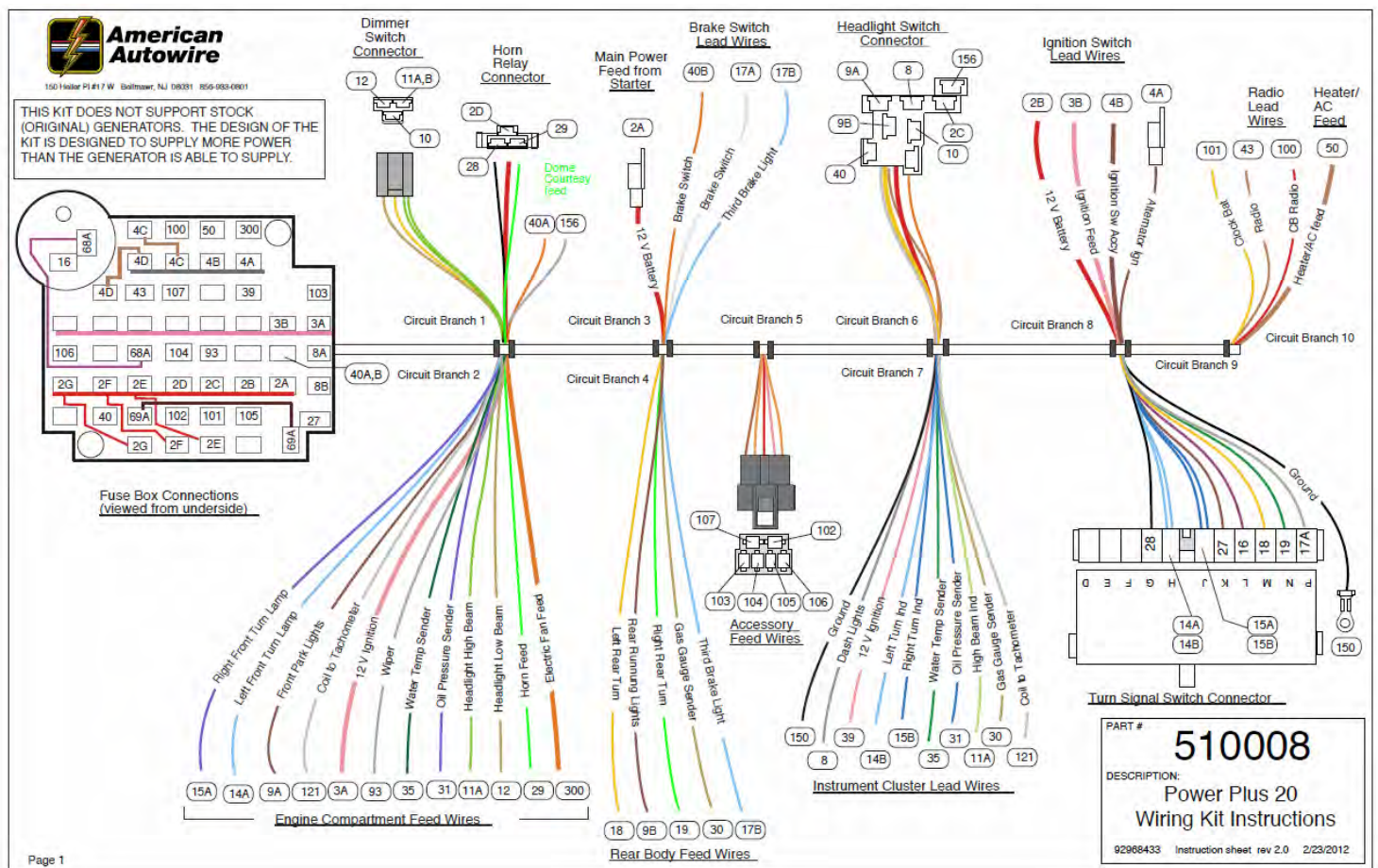
**(1) ECU/TCU control (2) body fuse panel (3) Dakota Digital and (4) Vintage Air.**

The traditional fuse panel takes the place of the BCM (Body Control Module) that is not used in a Gen V swap. The BCM handles a lot of functions such as cruise control, tap shift, tow mode and other advanced features that most new cars offer. To simplify the swap process most of the aftermarket harness providers remove this part of the harness. Your normal fuse panel contains interior electrical demand (turn-signals, heater etc), headlights and taillights. If you use **Dakota Digital** (see Gauges and Instrumentation below) for your dash, it acts as the third subsystem with its own buss. The fourth subsystem is Vintage Air (Or Old Air Products) which can provide heat only or heat/AC. It has its own logic and control system that simply connects into your existing heater circuit.

As for the body wiring harness, I suggest you dispense with whatever is there and use American Autowire, Painless, Ron Francis or Speedway 22 ([speedwaymotors.com](http://speedwaymotors.com)). I like American Autowire because of their schematics, check out the Route 9 to the Power Plus 20.







If you've got more than a simple street rod with power windows, 1500 watt amp or power seats, you'll need something more than the Route 9. They also offer complete restoration harnesses for cars like 1956 Chevys, but they will not work using the LT engines because the wiring theory is completely different than what was done 50 years ago. Do not try to adapt one of these original harnesses to the LT engine. We do not use generators or ammeters anymore and we produce substantially more wattage than the older systems can handle. I have done it both ways and, in the end, it is much easier to remove what's there and start from scratch.

## Gen V Pedal connections

J1 blue connector

cavity	circuit	color
14	1164	white/red
15	1161	yellow/white
30	1271	black/blue
33	1274	brown/red
34	1162	green or green/white
53	1272	black/violet

APP= Accelerator Pedal Position

description	ground
APP 5 volt ref (1)	
APP signal (1)	ground
APP position low reference (1)	
APP 5 volt ref (2)	
APP signal (2)	ground
APP low reference (2)	

car

truck

F

D

E

E

D

F

C

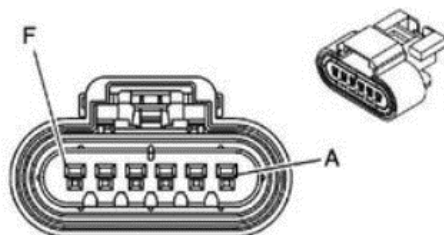
C

B

B

A

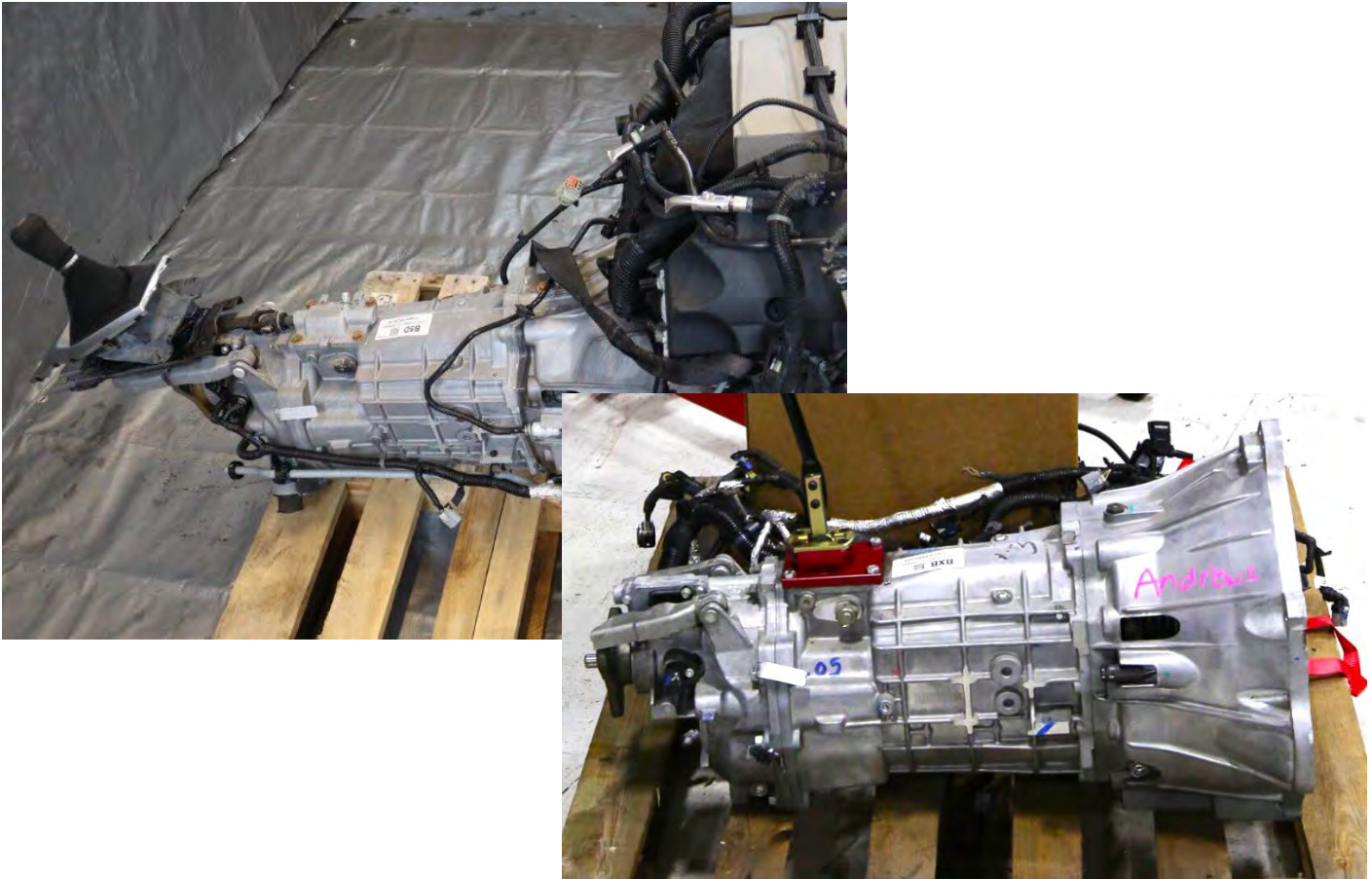
A



for truck pedal swap  
D & F

## Tremec TR6060 from the 2014 and newer Camaro

The TR6060 is a great transmission to use, but in stock form the shifter linkage is unusable in a swap.

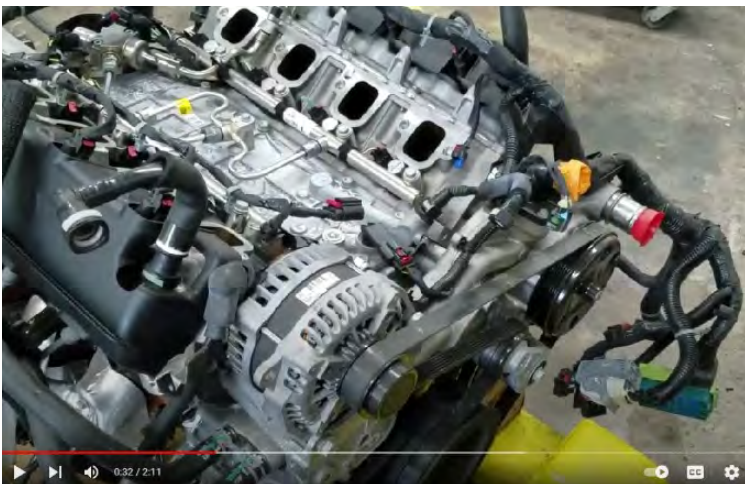


[www.threepedals.com](http://www.threepedals.com) offers a shifter relocation option that allows you to put the shifter in a more convenient location like the T56 Magnum. There's no reason not to buy a complete takeout with an LT4/LT1 with the manual shift option.

## PWM Alternator output

By default, the stock alternator outputs PWM and will not operate correctly without modification. You can modify your stock alternator from PWM to **'self-exciting'**, that simply requires the replacement of the internal regulator inside the alternator case, most local alternator shops can perform this for you. That changes the output to what we would refer to as a normal operation such as on Gen IV LS series engines.

For a better explanation listen to Ken Wolken of Standaloneharness.com.



<https://www.youtube.com/watch?v=cHgFaWMBgLI>



Gen III/IV/V	Years Offered	Engine Code (vin code)	Power (hp)	Torque (lb.-ft.)	Displacement (L)	Fuel 89/91/93	Bore (in)	Stroke (in)	Compression Ratio	Iron-Aluminum / Block-Heads	Block Features	Intake Port Shape	MAP Sensor	MAF Sensor	Throttle Body	Ignition Coil
III	1997-05	LS1 (G)	305-350 @ 5600	350-365 @ 4400	5.7	91[20]	3.9	3.62	10.25:1	Aluminum		Cathedral	12614970	19332972	3-Bolt DBC or DBW	D580
III	1999-07	LM7 (T)	270-295	315-335	5.3		3.78	3.62	9.49:1	Iron/Alum. heads		Cathedral	12614973	19330121	3-bolt DBW	D581 OR D585
III	1999-07	LR4 (V)	255-285	285-295	4.8		3.78	3.3	9.45:1	Iron/Alum. heads		Cathedral	12614973	19330121	3-bolt DBW	D581 OR D585
III	1999-08	LQ4 (U)	300-325 @ 5200	360-370 @ 4400	6		4	3.62	10.0:1	Iron/Iron-Alum. heads		Cathedral	12614973	19330121	3-bolt DBW	D581 OR D585
III	2001-05	LS6 (S)	385-405 @ 6000	385-400 @ 4800	5.7		3.9	3.62	10.5:1	Aluminum		Cathedral	12614970	19330121 or 19330122	3-Bolt DBC or DBW	D580
III	2002-07	L59 (Z)	285-295	320-335	5.3	E85-capable	3.78	3.62	9.9:1	Iron/Alum. heads		Cathedral	12614973	19351885	3-bolt DBW	D581 OR D585
III	2002-07	LQ9 (N)	345 @ 5200	380 @ 4000	6		4	3.62	10.0:1	Iron/Alum. heads		Cathedral	12614973	19330121	3-bolt DBW	D581 OR D585
III	2003-04	LM4 (P)	290	325	5.3		3.78	3.62	10.0:1	Aluminum		Cathedral	12614973	19330121 or 19330122	3-bolt DBW	D585
III	2005-08	L33 (B)	310 @ 5200	335 @ 4400	5.3		3.78	3.62	10.0:1	Aluminum		Cathedral	55573248	19351888	4-Bolt DBW	D514A or D510C
IV	2005-07,09	LS2 (U)	390-400 @ 6000	400 @ 4400	6	93	4	3.62	10.9:1	Aluminum		Cathedral	12644228	19330121	4-Bolt DBW	D514A or D510C
IV	2005-09	LH6 (M)	300-315	330-338	5.3		3.78	3.62	9.95:1	Aluminum	AFM, VVT*	Cathedral	12614973	19330121	4-Bolt DBW	D514A or D510C
IV	2005-09	LS4 (C)	315-320 @ 5200	335-340 @ 4000	5.3		3.78	3.62		Aluminum	AFM, FWD	Cathedral	55573248	19330124	4-Bolt DBW	D514A or D510C
IV	2006-15	LS7 (E)	505 @ 6300	470 @ 4800	7	91	4.125	4	11.0:1 [22]	Aluminum		Raised Square	12644569	15865791	4-Bolt DBW	D514A or D510C
IV	2007-08	L92 (8)	403	415	6.2		4.06	3.62	10.5:1	Aluminum	VVT	Rectangle	12614973	19330125	4-Bolt DBW	D514A or D510C
IV	2007-09	L76 (Y)	361-367 @ 5600	375-385 @ 4400	6		4	3.62	10.4:1	Aluminum	AFM	Rectangle	55573248	92281162 or 23256991	4-Bolt DBW	D514A or D510C
IV	2007-09	LY2 (C)	260-295	295-305	4.8		3.78	3.3	9.08:1	Iron/Alum. heads	no VVT	Cathedral	12614973	92281162	4-Bolt DBW	D514A or D510C
IV	2007-09	LY5 (J)	315-320 @ 5200	335-340 @ 4000	5.3		3.78	3.62	9.95:1	Iron/Alum. heads	AFM, VVT*	Cathedral	12614973	92281162	4-Bolt DBW	D514A or D510C
IV	2007-10	LY6 (K)	361 @ 5600	385 @ 4400	6		4	3.62	9.67:1	Iron/Alum. heads	VVT	Rectangle	12614973	23256991	4-Bolt DBW	D514A or D510C
IV	2007-13	LC9 (3)	315-320 @ 5400	335 @ 4000	5.3	E85-capable	3.78	3.62	9.95:1	Aluminum/Alum. heads	AFM, VVT*	Cathedral	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2008-09	LFA (5)	332 @ 5100	367 @ 4100	6	Hybrid	4	3.62	10.8:1	Aluminum	AFM	Rectangle	12644228	92281162	4-Bolt DBW	D514A or D510C
IV	2008-09	LH8 (L)	300 @ 5200	320 @ 4000	5.3		3.78	3.62		Aluminum		Cathedral	12644228	15865791	4-Bolt DBW	D514A
IV	2008-12	LMG (0)	315-320 @ 5200	335-340 @ 4000	5.3	E85-capable	4	3.62	9.6:1	Iron/Alum. heads	AFM, VVT*	Cathedral	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2008-17	LS3 (W)	426-436 @ 5900	420-428 @ 4600	6.2	93rec	4.06	3.62	10.7:1	Aluminum/Alum. heads		Rectangle	55573248	15865791	4-Bolt DBW	D514A or D510C
IV	2009-10	L98 (H)	362 @ 5700	391 @ 4400	6		4	3.62	10.4:1	Aluminum	L76 with AFM hardware removed	Rectangle	55573248	92281162 or 23256991	4-Bolt DBW	D514A or D510C
IV	2009-15	LSA (P)	556-580 @ 6100	551-556 @ 3800	6.2	93req	4.06	3.62	9.1:1	Aluminum/Alum. heads		Rectangle	12614970	19330122	4-Bolt DBW	D514A or D510C
IV	2009-12	L9H (Z)	403	415	6.2	E85-capable*	4.06	3.62	10.5:1	Aluminum	VVT	Rectangle	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2009-13	LS9 (R/T)[21]	638 @ 6500	604 @ 3800	6.2	92	4.065	3.62	9.1:1	Aluminum/Alum. heads		Rectangle	12592525	15865791	4-Bolt DBW	D514A or D510C
IV	2010-12	L20 (A)	260-302 @ 5400	295-305 @ 4600	4.8	E85-capable	3.78	3.3	8.8:1	Iron/Alum. heads	no AFM, VVT	Cathedral	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2010-12	L94 (F)	403 @ 5700	417 @ 4300	6.2	E85-capable	4.06	3.62	10.4:1	Aluminum/Alum. heads	AFM, VVT	Rectangle	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2010-12	LZ1 (J)	332 @ 5100	367 @ 4100	6	Hybrid	4	3.62	10.8:1	Aluminum	AFM, VVT	Rectangle	12644228	92281162	4-Bolt DBW	D514A or D510C
IV	2010-15	L99 (J)	400 @ 5900	410 @ 4300	6.2	E85-capable	4.06	3.62	10.4:1	Aluminum/Alum. heads	AFM, VVT,	Rectangle	55573248	15865791	4-Bolt DBW	D514A or D510C
IV	2010-17	L96 (G)	322-360 @ 4400-5400	373-382 @ 4200-4400	6	E85-capable	4	3.62	9.7:1	Iron/Alum. heads	VVT	Rectangle	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2010-17	LC8	282-360	320-380	6	93C	4	3.62	9.1:1	Iron/Alum. heads	VVT	Cathedral	12644228	23256991	4-Bolt DBW	D514A or D510C
IV	2011-16	L77 (2)	362 @ 5700	391 @ 4400	6	E85-capable	4	3.62	10.4:1	Aluminum	AFM	Rectangle	55573248	92281162	4-Bolt DBW	D514A
IV/V	none	LSX376	450 @ 5900	444 @ 4600	6.2	92	4.06	3.62	9.0:1	Aftermarket		Rectangle	N/A	N/A	N/A	N/A
IV/V	none	LSX454	620 @ 6200	590 @ 4800	7.4	92	4.185	4.125	11.0:1	Aftermarket		Raised Square	N/A	N/A	N/A	N/A
IV/V	none	LSX454R	776 @ 7000	680 @ 4500	7.4	110	4.185	4.125	13.1:1	Aftermarket [23]		Raised Square	N/A	N/A	N/A	N/A
V	2014–present	L83 (C)	355-376 @ 5600	383-416 @ 4100	5.3	E85-capable	3.78	3.62	11.0:1	Aluminum/Alum. heads	AFM	Square	12644228	23262343	12617792	D514A or D510C
V	2014–present	L86 (J)	420 @ 5600	460 @ 4100	6.2	NO	4.06	3.62	11.5:1	Aluminum/Alum. heads	AFM	Square	12644228	23262343	4-Bolt DBW	D514A
V	2014–present	LT1	455-460 @ 6000	455-465 @ 4600	6.2	93rec	4.06	3.62	11.5:1	Aluminum/Alum. heads	AFM VVT	Square	12644228	23262344	4-Bolt DBW	D514A or D510C
V	2015–present	LV3	285-297 @ 5300	305-330 @ 3900	4.3	E85-capable	3.92	3.62	11.0:1	Aluminum/Alum. heads		Square	12644228	23262343	12676296	D514A or D510C
V	2015–present	LT4	640-650 @ 6400	630-650 @ 3600	6.2		4.06	3.62	10:1	Aluminum/Alum. heads	AFM VVT	Square	12644228	23262344	4-Bolt DBW	D514A or D510C
V	2018?–present	L8B	355-376 @ 5600	383-416 @ 4100	5.3	E85-capable	3.78	3.62	11.0:1	Aluminum/Alum. heads	E assist	Square	12644228	23262343	12617792	D514A or D510C
V	2019–present	LT5	755 @ 6400	715 @ 5000	6.2		4.06	3.62	10:1	Aluminum/Alum. heads	Dual Injection	Square	12644228	12676479	12669871	D510C
V	2019–present	L82	355-376 @ 5600	383-416 @ 4100	5.3		3.78	3.62	11.0:1	Aluminum/Alum. heads	AFM	Square	12644228	12671620	12617792	D514A
V	2019–present	L84	355-376 @ 5600	383-416 @ 4100	5.3		3.78	3.62	11.0:1	Aluminum/Alum. heads	DFM	Square	12644228	12671620	12617792	D514A or D510C
V	2019–present	L87	420 @ 5600	460 @ 4100	6.2		4.06	3.62		Aluminum/Alum. heads	DFM	Square	12644228	12671620	12678312	D510C
V	2020–present	L8T 6.6L	401 @ 5200	464 @ 4000	6.6	87	4.06	3.86	10.8:1	Iron/Alum. heads						



## Gen III & Gen IV harness connectors (courtesy of ICTbillet)



A/C Compressor - GM / Vortec / R4  
Pigtail: WPACV30  
Extension: WEACV30-24



Alternator - 4 pin  
Pigtail: WPALT30  
Extension: WEALT30-36



Alternator - 2 pin  
Pigtail: WPALT40  
Extension: WEALT40-36



Coil Harness  
Male-Pigtail: WPCLM30



Coil Harness  
Female-Pigtail: WPCLF30



Ignition Coil - D510C, D581, D514A, D585C  
Pigtail: WPCIL30



Ignition Coil - D580 (LS1 Coil Only)  
Pigtail: WPCIL31



Crankshaft Position Sensor Gen 3  
Pigtail: WPCPK30  
Extension: WECKP30-36



Crankshaft Position Sensor Gen 4  
Pigtail: WPCPK40  
Extension: WEACKP40-36



Camshaft Position Sensor Gen 3  
Pigtail: WPCMP30  
Extension: WECAM30-48



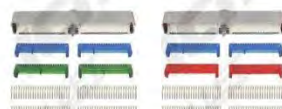
Camshaft Position Sensor Gen 4  
Pigtail: WPCMP40  
Extension: WECAM30-48



Coolant Temperature Sensor - 2 wire  
Pigtail: WPCTS30  
Extension: WECTS30-36



Coolant Temperature Sensor - 3 wire  
Pigtail: WPCTS33  
Extension: WETPS30-24



ECM Engine Computer Connector  
Blue/Green: WPECM30BG  
Blue/Red: WPECMBR



Fuel Injector EV1/Jetronic (LS1)  
Pigtail: WPINJ30



Fuel Injector Multec/Mini Delphi Truck  
Pigtail: WPINJ31



Fuel Injector USCAR (LS3)  
Pigtail: WPINJ40



Idle Air Control Valve  
Pigtail: WPIAC30  
Extension: WEIAC30-24



Intake Air Temperature Sensor  
Pigtail: WPIAT30  
Extension: WEIAT30-24



Knock Sensor LS1  
Pigtail: WPKN010



Knock Harness Gen 3 - Female  
Pigtail: WPKN030  
Extension: WEKN030-36



Knock Sensor Gen 4  
Pigtail: WPKN040



MAF Sensor Gen 3 - 5 wire  
Pigtail: WPMAF30  
Extension: WEMAF30-24



MAF Sensor Gen 3 - 3 wire  
Pigtail: WPMAF31  
Extension: WEMAF31-48



MAF Sensor Gen 4 Truck Tube Style  
Pigtail: WPMAF40  
Extension: WEMAF40-48



MAF Sensor Gen 4 Truck Cartridge Style  
Pigtail: WPMAF41  
Extension: WEMAF41-48





**MAF Sensor LS3 Gen 4**  
Pigtail: WPMAF43  
Extension: WEMAF43-48



**MAP Sensor Gen 3**  
Pigtail: WPMAP30  
Extension: WEMAP30-24



**MAP Sensor Gen 4**  
Pigtail: WPMAP40  
Extension: WEMAP40-24



**OBD2 Dash Diagnostic Port 4-wire**  
Pigtail: WPOBD30



**Oil Pressure Sensor DBC**  
Pigtail: WPOIL30



**Oil Pressure Sensor DBW**  
Pigtail: WPOIL33



**Oil Pressure Sensor Gen 4**  
Pigtail: WPOIL40



**Oxygen Sensor Flat 4-wire - Female**  
Pigtail: WPOXY30



**Oxygen Sensor Flat 4-wire - Male**  
Pigtail: WPOXY31



**Oxygen Sensor Square 1-keyway - Male**  
Pigtail: WPOXY32



**Oxygen Sensor Square 1-keyway - Female**  
Pigtail: WPOXY34



**Oxygen Sensor Square 2-Keyway - Male**  
Pigtail: WPOXY33



**Oxygen Sensor Square 2-keyway - Female**  
Pigtail: WPOXY35



**Oxygen Sensor Trapezoid - Male**  
Pigtail: WPOXY36



**Oxygen Sensor Trapezoid - Female**  
Pigtail: WPOXY37



**Throttle Body 8-Wire Gen 3**  
Pigtail: WPTHB30  
Extension: WETHB30-12



**Throttle Body 6-Wire Gen 4**  
Pigtail: WPTHB40  
Extension: WETHB40-12



**Throttle Pedal Position Sensor**  
Pigtail: WPAPP40  
Extension: WEAPP40-72



**Throttle Position Sensor**  
Pigtail: WTPS30  
Extension: WETPS30-24



**Transmission Harness**  
4L60/65/70E: WPTRA36  
4L80E: WPTRA38



**Transmission Neutral Safety Switch**  
Pigtail: WPNSS30



**Transmission Range PRNDL Sensor**  
Pigtail: WPTRR30

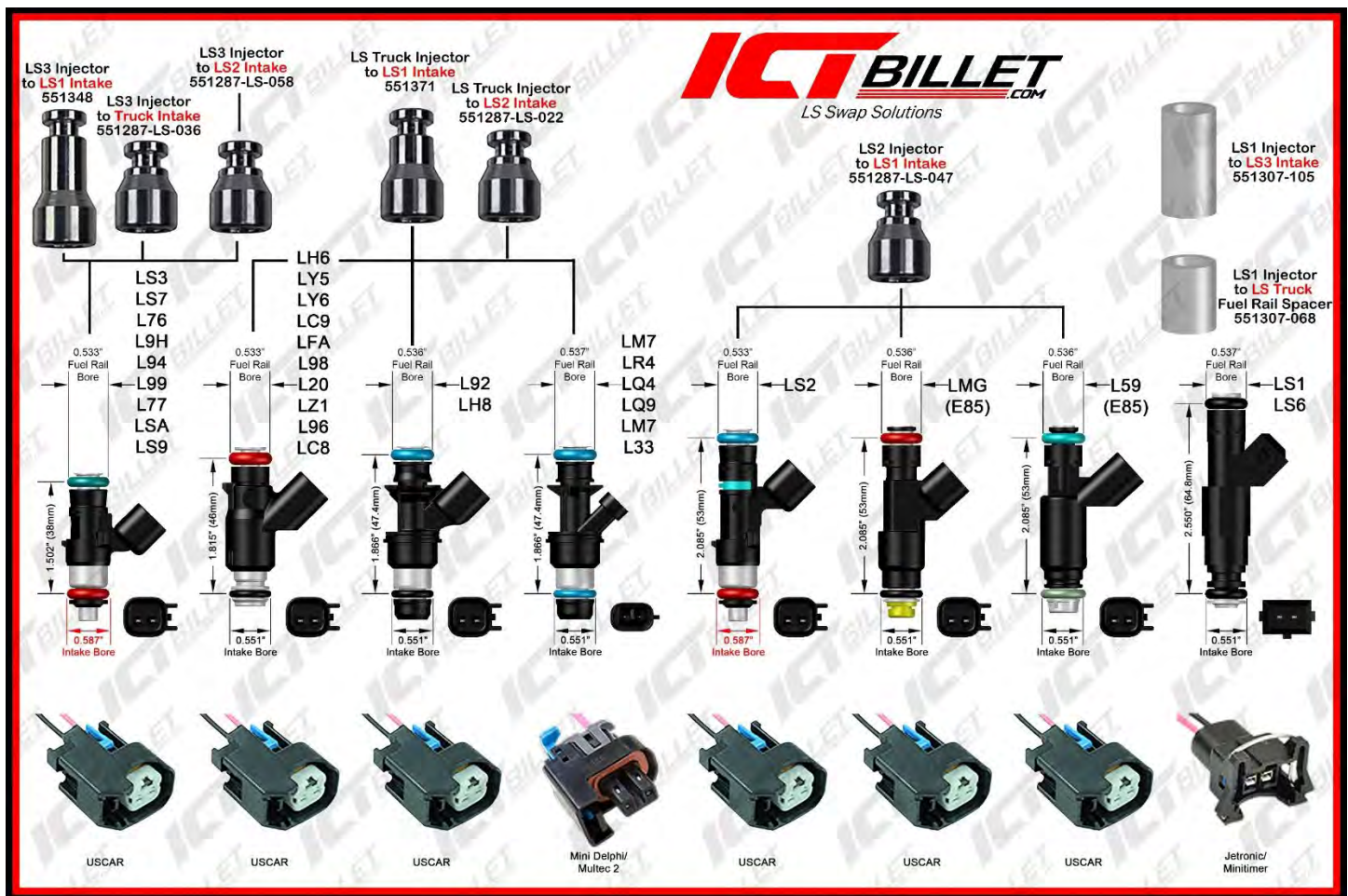


**Transmission Vehicle Speed Sensor**  
Pigtail: WPVSS30

### Wire Adapters

WAALT30-6	4-Pin Alternator to 2-Pin High-amp 6"
WAALT30-36	4-Alternator to 2-pin High-amp 36"
WAALT40-6	2-Pin Alternator High-amp to 4-Pin 6"
WAALT40-36	2-Pin Alternator High-amp to 4-Pin 36"
WACAM40-6	Gen 4 Camshaft Position Sensor Adapter 6"
WACKP30-6	Gen 4 Crank Position Sensor to Gen 3 Harness 6"
WACKP40-6	Gen 3 Crank Position Sensor to Gen 4 Harness 6"
WAINJ30	Jetronic EV1 to Mini Delphi Multec 2 Fuel Injector
WAINJ31	Jetronic EV1 to USCAR EV6 Fuel Injector
WAINJ32	Mini Delphi Multec 2 to USCAR EV6 Fuel Injector
WAINJ33	Mini Delphi Multec 2 to Jetronic EV1 Fuel Injector
WAINJ40	USCAR EV6 to Mini Delphi Multec 2 Fuel Injector
WAINJ41	USCAR EV6 to Jetronic EV1 Fuel Injector
WAMAF30-60	Gen 3 MAF, IAT Sensor Breakout Harness
WAMAF31-6	Gen 3 3-wire MAF to 5-wire IAT Breakout Harness
WAMAF32-6	Gen 3 3-wire MAF to 5-wire LS3 Card Style MAF-IAT
WAMAF33-6	Gen 3 MAF-IAT to Gen 4 LS3 Card Style MAF-IAT
WAMAF40-6	Gen 4 Truck Tube Style MAF to LS3 Card Style MAF-IAT
WAMAF41-6	Gen 4 Truck Card Style to LS3 Card Style
WAMAF42-6	Gen 4 MAF-IAT Breakout Harness
WAMAP30-6	Gen 3 Vehicle to 3-bar Brick Style MAP Sensor
WAMAP31-6	Gen 3 Vehicle to Gen 4 Bosch Style MAP Sensor
WAMAP40-6	Gen 4 Vehicle to Gen 3 MAP Sensor
WAT5630	T56 Skip Shift Eliminator
WATRA30-18	4L60E to 4L80E Transmission
WATRA31-18	4L70E to 4L80E Transmission
WAWT40-10	VVT to NON-VVT Camshaft Sensor Connector





## VSS – Vehicle Speed Sensor

Unlike the LS series of engine, Gen V engines require a VSS signal. If the engine does not see the VSS signal it will go into **"limp mode"** and provide 1/3 throttle. To wire in a digital speedometer use the Autometer schematic below. If you're using the Dakota Digital system, it uses a single wire VSS signal piggybacked off the signal from a manual transmission.

The **8L90E** transmission is a second-generation model that uses an electronic controller built within the transmission itself. If you're using the GM "Connect and Cruise" system it includes a separate controller (TCU) that communicates back and forth between the engine ECU and the transmission itself. The new 8L90E transmission will only work on Gen V engines, it will not work on previous engines like the Gen IV LS. GM also has the same transmission in a 10 speed – **10L90e**. You can also consider the older **6L80e** transmission which is still in production as a crate option, it was used on 2014-2019 L83/86 Truck engines. The 6L80e transmission was the only transmission that GM built that has the controller built into the valve body of the transmission itself, all the others have a separate TCU (Transmission Control Unit).



The TCU is part of the CANBUS or GMLAN electronic control system and is for all practical purposes standalone, they do not want you piggybacking off the system because you can potentially disrupt the network transmission protocol.



For the 8 speed automatic transmissions, the vehicle speed information is fed to the transmission controller through a pulse signal. The Vehicle Speed Sensor connector (on the wiring harness) is integral on the 8L90E and is part of the harness that plugs into the transmission. The ECM is programmed and looking for 40 pulses per revolution. On the Connect N Cruise systems with the 8 speed automatic there are two wires in the wiring harness that are labeled **Tach** and **Speedo**, these wires are

CANBUS signals from the Bulkhead connector.

GM Powertrain recently brought to my attention that pin 14 (grey/blue wire) out of the transmission will provide a non-CANBUS raw signal (pulse generated) that should drive a conventional electronic speedometer. This is an inductive type signal, so voltage output is dependent on speed. You may be able to get the Speedo to work if you use the Dakota Digital SGI-5E expansion module.

***“Vehicle Speed Input. The ECM in each of these kits (Connect-n-Cruise) are not programmed identically and are not interchangeable. The ECM for the 4L/T56 is programmed and looking for 40 pulses per revolution, typical of a GM automatic transmission. The T56 Super Magnum transmission is specifically built to provide 40 pulses per revolution also. Both transmissions provide this input to the ECM via a sensor located in the tail shaft housing of the transmission. The 8 speed transmission provides the VSS over the CAN signal and the VSS sensor of the engine wire harness is not used. The ECM must have a Vehicle Speed Signal to operate the engine.”***

Circuit 121 and 818 are the VSS signal (T56 see below)

- Vehicle Speed (BROWN) – This is a non-scaled output for use with auto-scaling speedometers and will not function unless a vehicle speed sensor (VSS) is connected to the ECM through the VSS wire in the harness.


### **ECM CONNECTOR PINOUTS**

ECM

Black

Item J1

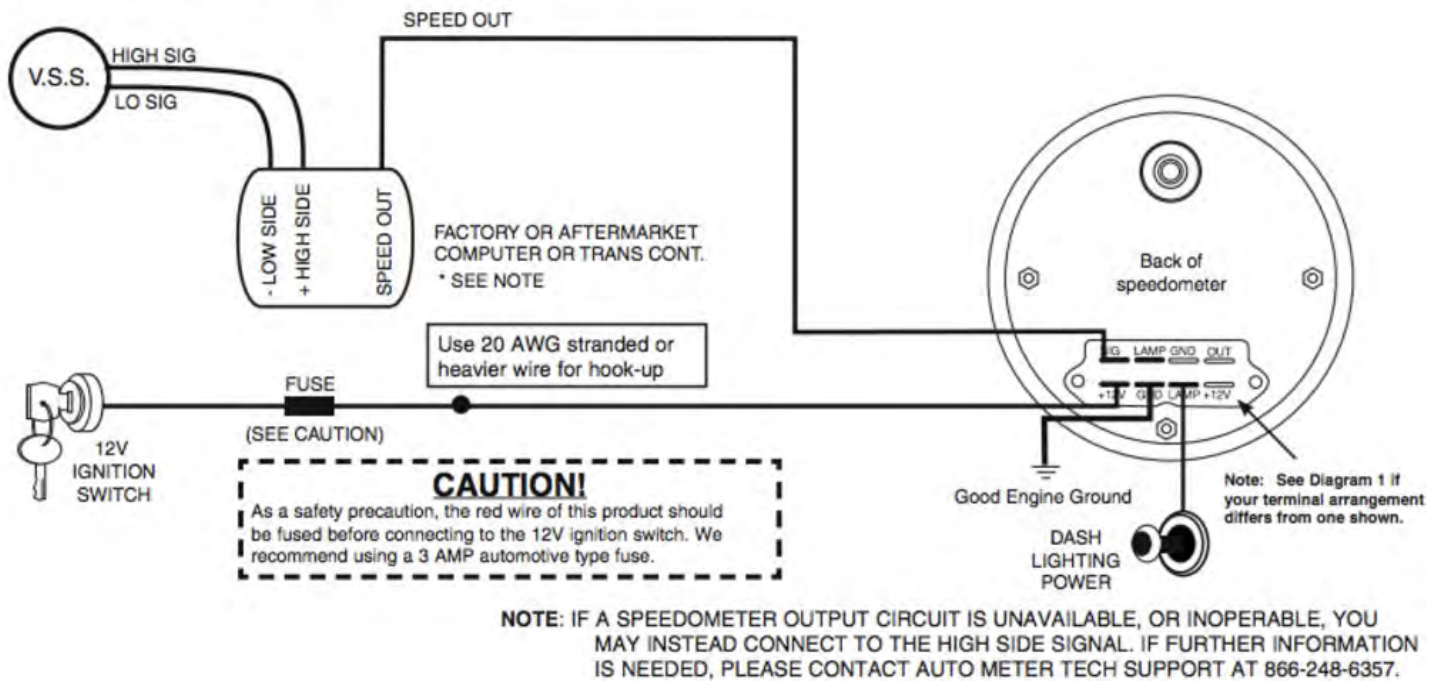
<u>Cavity</u>	<u>Circuit</u>	<u>Size(mm)</u>	<u>Color</u>	<u>Circuit Description</u>
3	2919	0.5	BK/LG	Fuel Rail Pressure Sensor Low Reference
6	C 821	0.5	PP/WH	Vehicle Speed Sensor +
7	C 822	0.5	GN/BK	Vehicle Speed Sensor -

Bulk head Connector				Mating connector
				15326849 Connector
				12191818 Female Terminal
				15366021 Seal
				15305171 Plug
				15430903 TPA
				15317832 CPA
Circuit #	Position	Wire Gage	Color	Description
2501B	A	22	Tan	GMLAN High Speed (-)
-	B	-	Plug	Empty
121	C	22	White	Engine Speed
818	D	22	Brown	Vehicle Speed - Out
-	E	-	Plug	Empty
-	F	-	Plug	Empty
2500A	G	22	Tan/Black	GMLAN Low Speed (+)
331B	H	22	Tan/White	Oil Pressure Signal
-	J	-	Plug	Empty
40F	K	18	Orange	Battery Power Fuse
5292	L	18	Pink	Ignition "On" Power
50B	M	18	Black	Ground





## Wiring w/ most OEM 2-wire V.S.S. when using computer or trans controller



## Radiator and Fan Control

Since the LT4 develops 650 HP you need to make sure whatever radiator you are using is up to handling the job, and that means dual fans because these engines produce substantial amounts of heat. Even after turning off the engine, the engine is warm to the touch after 6 hours. There are lots of high-end radiators such as [Ron Davis](#) and [AutoRad](#), but I ended up using a US built radiator from [Entrophy](#). This picture shows the LS/LT

option with both inlet and outlet on the same side. For those of you who have been running Gen 1 and 2 engines, these modern engines run much hotter, the first fan kicks in at 207deg and the second at 221deg, do not attempt to modify these parameters. I've talked with many old hot-rodders who do not understand this and attempt to lower the temperatures because they feel uncomfortable with an engine running at those temperatures, this is foolish and will cause problems, not to mention lowers the overall performance of the engine.



The GM harnesses for the LT1/LT4 part numbers **19418585**, **19418587**, **19418589**, **19418591**, **19370428**, **19417363** and **19417364** provide fan control with a conventional ground signal that triggers a relay. On both the LT1 and LT4 harnesses there are two relays which control two fans separately. The stock water temperature thermostat is set for 194 degrees.



**Cavity 42** (see below), which is normally empty on a stock engine harness has an additional circuit added (CFN2C) which appears to be the difference between a PWM (Pulse Width Modulated) signal that is in **Cavity 59**. Most aftermarket harnesses provide a single PWM signal that needs a PWM fan (2018 Camaro fan or similar Truck fan) or you can use a Spal PWM controller from a GM vehicle from 2014 to 2019 (**23188752**) and (**23506648**). These are also available from SwapTimeUSA with or without the controller.

[https://www.swaptimeusa.com/store/p16/PWM\\_Fan\\_Controller\\_with\\_harness.html](https://www.swaptimeusa.com/store/p16/PWM_Fan_Controller_with_harness.html)

Here are two more brushless PWM fans that connect directly to the PWM fan output wire.



2018 Malibu PWM Fan #3115301



2018 Silverado # 23123633

The PWM fan controller continuously monitors your engine's temperature, thereby controlling the temperature and increasing the vehicles cooling efficiency, while reducing the amps used to do so. The net result is the electric fans often only run between 40-60% to keep your engine cool.



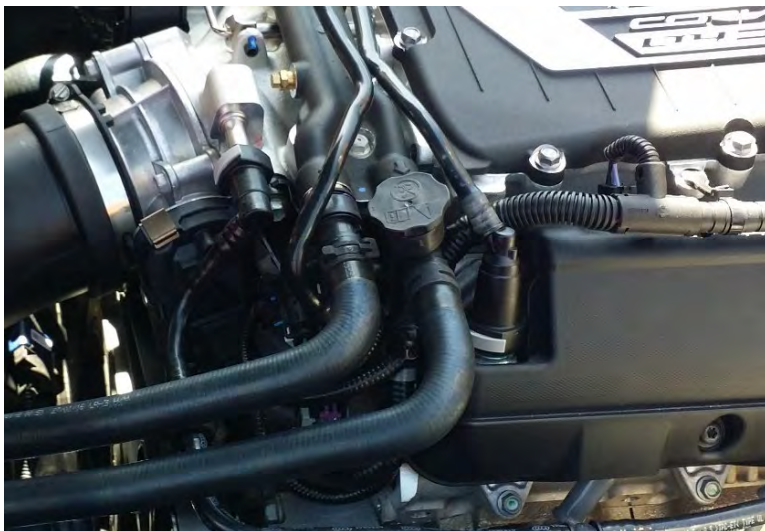
### Blue Connector - J1

Cavity	Circuit	Size(mm)	Color	Circuit Description
2	7446	0.5	LB/WT	Fuel Line Pressure Sensor Signal
4	3200	0.5	YL/WT	Throttle Inlet Absolute Pressure Sensor Signal
5	3201	0.5	WT/RD	Throttle Inlet Absolute Pressure Sensor 5V Reference
8	7447	0.5	BK/YL	Fuel Line Pressure Sensor Low Reference
14	1164	0.5	WT/RD	Accelerator Pedal Position 5 Volt Reference (1)
15	1161	0.5	YL/WT	Accelerator Pedal Position Signal (1)
24	7445	0.5	BR/RD	Fuel Line Pressure Sensor 5V Reference
30	1271	0.5	BK/LB	Accelerator Pedal Position Low Reference (1)
33	1274	0.5	BR/RD	Accelerator Pedal Position 5 Volt Reference (2)
34	1162	0.5	LG/WT	Accelerator Pedal Position Signal (2)
36	7493A	0.5	LB/BK	High Speed GMLAN Serial Data (+)(3)
37	7494A	0.5	WTHigh	Speed GMLAN Serial Data (-)(3)
39	2500	0.5	LBHigh	Speed GMLAN Serial Data (+)(1)
40	2501	0.5	WTHigh	Speed GMLAN Serial Data (-)(1)
41*	2918	0.5	BU/WH	Fuel Rail Pressure Sensor Signal
42	CFN2C	0.5	BL/RD	Fan2 Control
43	C818	0.75	BN	Vehicle Speed Output
44	465	0.5	LG/GY	Fuel Pump Primary Relay Control
46	419	0.5	BR/WT	Check Engine Indicator Control
51	439A	0.5	VT/LG	Run/Crank Ignition 1 Voltage
52	740	0.5	RD/YL	Battery
53	1272	0.5	BK/VT	Accelerator Pedal Position Low Reference (2)
59	2366	0.5	WT/BK	Cooling Fan Control Relay Speed Signal
60	5291	0.5	VT/LB	Powertrain Main Relay Fused Supply (2)
64	C20	0.5	YE	Top of Travel Clutch Switch
67	5292	0.75	VT/LB	Powertrain Main Relay Fused Supply (3)
72	5991A	0.5	YL	Powertrain Relay Coil Control
73	5290B	2.5	VT/LB	Powertrain Main Relay Fused Supply (1)

\*Dependent on harness

### Supercharger Intercooler

Little is published about the system that GM designed to cool down the supercharger on the LT4. I have had several calls lately asking me to add this missing information. On the original 2015 Corvette Z06 the



intercooler radiator is stacked up against the AC radiator and the regular engine radiator. There is a small capacity reservoir that sits next to the right front wheel tucked way down into the engine bay, that's why the fill cap is on the top as shown below.

The intercooler system (or heat exchanger) uses conventional 50/50 GM Dex-Cool antifreeze. There are two little brass bleed screws on the very top of the inlet and outlet passages that allow you to burp the system and remove any unwanted air in the system. This is challenging

at best and is hard to eliminate every bubble from the system.

When the first Z06s hit the track in 2015/2016 they had overheating problems and after 6-8 laps of hard running they went into 'limp mode' because their engine oil was overheating. The entire cooling system, including the intercooler bricks were insufficient to cool the engine down.

To me using 200+ degree radiator water to cool the oil going through the oil cooler (mounted on the side of the pan) didn't make a lot of sense, so I took a clue from the off-road desert racers and built a remote oil cooler and intercooler in front of the radiator. By extending the engine oil routing to the externally mounted air to oil cooler I increased the engine oil capacity from 10 quarts to 12 quarts. I haven't had any overheating issues with this system in place. The Truck engines (L82, L83, L84, L86 & L87) use a conventional front mounted engine oil cooler.

I was concerned about impeding the flow to the main radiator, so I started with smaller stacked plate radiators with the intention to increase the size if necessary. After running several "dyno pulls" we concluded that there was no IAT (Intake Atmospheric Temperature) increase in temperature and the stacked plate cooler provided sufficient cooling for most applications. For Autocross and Track events you may want to increase the cooling capacity. I'm now using the stock Camaro trans cooler for the engine oil.

It's 24" wide, has mounting brackets and you can reuse your existing bubble flare wedge cooling lines to snap in place.



## Gauges and Instrumentation

Modern engines use a CAN Bus (Controller Automotive Network) and GM's version is known as GMLINK. To get your gauges to work I suggest you read [Autometer's installation guides for LS engines](#), first before you do anything. For me I think the easiest approach is to use **Dakota Digital's** VHX/HDX/RTX gauge system with the [BIM-01-2 OBD 2](#) interface. This reads the information from the OBD 2 diagnostic port and converts the signals into something that the Dakota Digital system understands.

They're also really easy to wire because they use a conventional Cat 5 ethernet cable to connect the gauges to their buss.







The **BIM-01-2** OBD-II (J1850/CAN) Interface allows you to plug directly into the engine diagnostic port, extracting engine and transmission data from the vehicle's computer (ECM). The **BIM-01-2** will collect and output the following information to Dakota Digital Instrument Systems:

available:

- Speed
- Tachometer
- Engine Temp
- Check Engine Indicator

Vehicle specific:

- Intake Air Temp
- Transmission Temp
- Ambient Air Temp
- Gear Position
- Oil Pressure



Always

*"Due to the various factory and modified ECM's, additional data including (Intake Temp, Transmission Temp, Ambient Air Temp, Oil Pressure, and Gear Position) may be available, but will vary from application to application. Dakota Digital cannot guarantee the presence or accuracy of the Intake Temp, Transmission Temp, Ambient Air Temp, Oil Pressure, or Gear Position displays since this is a function of the ECM and matching OEM functional sensors."*

For LS and LT engines which have a 2 wire oil pressure GMLAN reference sensor the VHX system may not read this signal through the ODB connection. The LT1/LT4 already has an extra oil pressure sensor located right above the oil filter. You can install Dakota Digital's 03-8 sender which is included in their gauge package with a 12mm x 1.5 adapter to read the oil pressure. To read the signal only requires changing the signal from BUS to Sender in the setup procedure.

Also, there are no blank plugs that are available to install a water temperature sender. Your options are limited here unless you want to install it in the water pump outlet (drill a hole), the radiator hose or the radiator itself. Gen V engines have a built in CANBUS signal for the water temperature, so you can use the *native signal directly to power the water temperature gauge in the Dakota Digital gauge set.*



I completely redesigned the oil cooling system, removed the oil cooler from the side of the pan and installed conventional oil coolers at the front of the radiator. I installed a conventional sender (DD 04-5) at the end of the water pump.



This was my solution, but it may not be something you want to attempt.

The existing water temperature sensor is shown on the top of the water pump, but you

cannot share this connection because it's part of the CAN bus and won't give you a signal that you can use unless you install the Dakota Digital VHX with BIM-01-2.

## **Fuel Pump**

GM recommends a Pulse Width Modulated returnless system.

This control system is a stand alone, fully-integrated kit designed to run Chevrolet Performance LT4 series crate engines with 58x crankshaft reluctor wheels, 4x camshaft indexing, and electronic throttle control (ETC). This engine control kit is designed to operate a "GEN 5" V8 only, it is not designed to operate any earlier engine configurations. Included in the kit are the engine control module (flashed with the appropriate calibration), fuel pump power module, engine harness, accelerator pedal, mass air flow (MAF) sensor, MAF sensor mounting boss, fuel line pressure sensor, oxygen sensors (2), and oxygen sensor mounting bosses (2). This control system is intended for use with a returnless fuel system and fuel pump that is capable of being pulse width modulated (PWM) at 25 kHz to control fuel pressure. A fuel flow rate of 65.6 G/H at 58 psi (400) kPa is needed. Because this is a dead headed system, a pressure relief set at 84 psi (580 KPa) must be included in the fuel line between the tank pump and the engine mounted high pressure pump.

Chevrolet Performance Part Number 19303293 is one example of a compatible fuel pump and it includes an internal pressure relief system. If using this pump, the lower port on the module may be left open or used to connect a remote pick up system. P/N 13587174 is connector pigtail for this pump and is available from your local dealer.

A pump with excessive capacity may result in cavitation at low flow due to the pump repeatedly stopping and starting instead of controlling to a speed/pressure. Alternatively, a fuel system operating at a fixed 500 KPa could be used and a fuel pump relay may be triggered by the Green/Gray wire in cavity 2 of the Fuel Pump Power Module (FPPM). Note that excessive fuel heating and potential startability/drivability issues may result from a constant high pressure.

[Rick's Tanks in Texas](#) provides a pre-configured fuel tank that supports the use of a GM fuel pump 19303293. They also offer a weld-in adaptor plate, a bolt in adaptor and complete tanks ready to go.







They also offer specific fittings and the wiring adapter plugs for the fuel pump. They just released this new bolt in kit that will work on just about any existing tank. The main issue is having enough room in an existing tank that allows for all of the connections. This pictures shows all the wiring, fuel pressure sensor, the vent line and the fuel level sender.



GM has decided that they no longer want to recycle unused gas from conventional pumps, so they have come up with this new system to satisfy the demands of the new generation of Direct Injection Engines. Since the fuel pressures can be upwards of 2,500 psi, the FPPM (Fuel

Pump Pressure Module) monitors the fuel pressure sensor (inline on the fuel hose) and communicates back and forth between the ECM and the fuel pump to deliver sufficient pressure.

It's also recommended that you **"do not use a fuel line filter"** anywhere along the system because the fuel pump itself has filters to take care of any issues. On a final note, there is no conventional fuel pump relay in the system. It appears that the fuel pump relay is electronic and housed within the FPPM module. As of this date GM has not addressed how the Fuel pump is fused, every time I call now they tell me that I'm asking engineering level questions and they are unable to respond. I suspect that it's the 30 amp fuse in the PT (Powertrain) relay No. 2 in the fuse panel.

**(Update 2/24/20)** After reviewing the latest Gen V harnesses it has come to my attention that the PWM fuel pump as described above is not necessary in some cases. Many of the aftermarket Gen V harnesses use a conventional style LS pump (intank or remote) with the integral C5 fuel filter regulator (58 psi).



As Standaloneharness.com states, ***"We can set the ECM to control a relay (discrete) that runs a standard Walbro type Fuel Pump and a regulator just like an LS Swap. The relay will be integral to our fuseblock. We've used 255 LPH on the L83 5.3, 300 LPH on the L86 and LT1 6.2 Liter Engines. For all setups we recommend that a manually adjustable Fuel Pressure Regulator (0-100 PSI) is used and the pressure is set at around 63-75 PSI."***

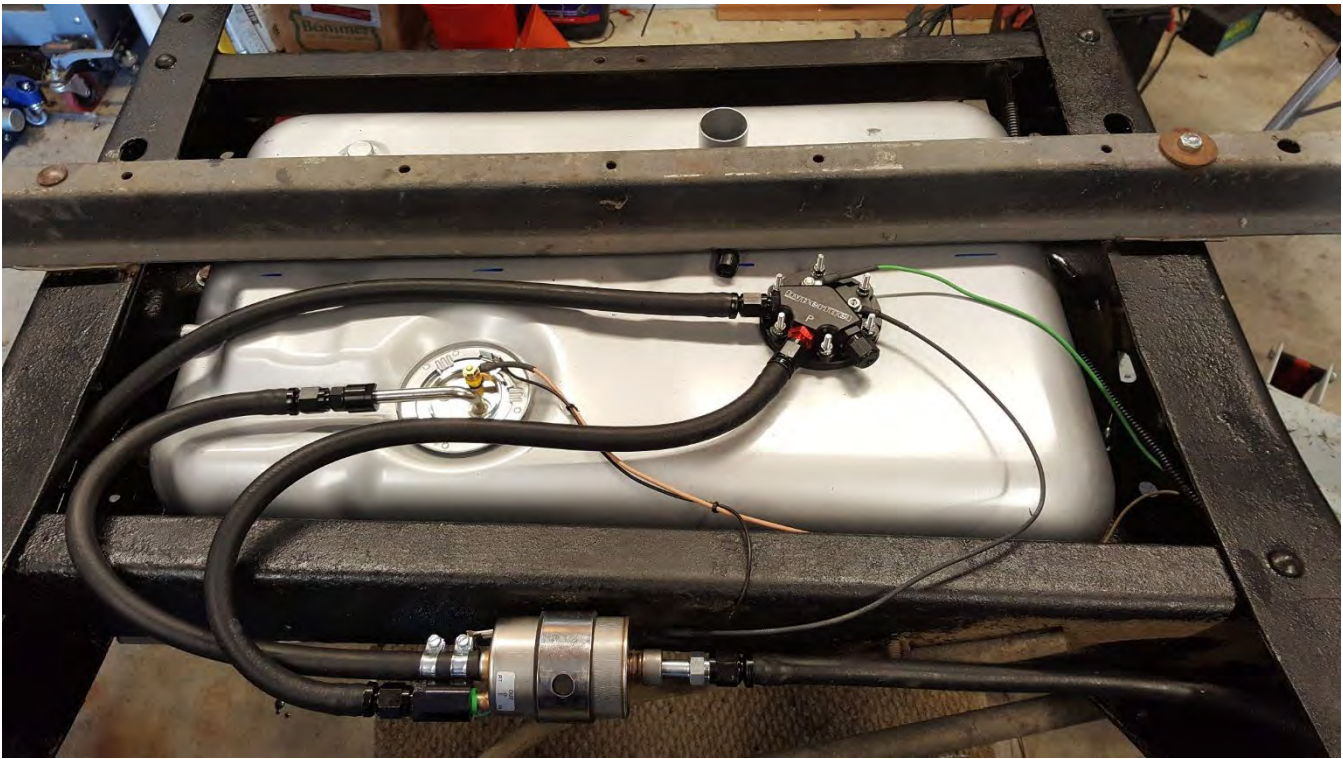
Speartech, Howell EFI and 150Tunes all offer new Gen V harnesses without the FPPM module and no PWM fuel pump.

The pictures below illustrate the parts necessary to install an intank fuel pump (Hyperfuel 40015), 2002 Corvette fuel filter regular, tank level sender, return line and overflow line.



The green wire is the fuel pump power from its relay, the black wire is the ground and the beige wire is the fuel level sender.





For questions, comment, corrections, or additional information please contact me at:

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