SpecRacer Ford GEN3

Conversion Manual

AccelRaceTek Version
Revision 1.2
June 2018

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1. Conversion Overview

1.1. Conversion Process Steps

The conversion process has seven key steps. The following outlines the steps.

Step 1 – Planning and Preparation

The first thing to do is planning. Additional parts might be required if the GEN2 is not up to date with upgrades. Also, planning on swapping or rebuilding the transaxle prior to starting is recommended.

Step 2 - Disassembly

The second step is to remove the motor, transaxle, other parts that will be replaced with the GEN3 components.

Step 3 - GEN2 Part Modifications

The third step it to modify selected GEN2 parts to GEN3 requirements.

Step 4 – Sub-Assembly Builds

The forth step is to assemble sub-assemblies that will go into the final assembly or motor installation.

Step 5 – Pre-Engine Assembly

The fifth step is the assembly of the upgraded GEN2 parts and the new GEN3 parts before the engine is installed.

Step 6 – Engine Installation

The sixth step is the installation of the motor and all of the connections to the motor prior to starting the engine.

Step 7 – Engine Run-in and Testing

The seventh and final step is the final check list, the ECU configuration, initial run-in and testing.

1.2. Planning

The time to complete a GEN3 conversion can range from days to months. Planning will help get the conversion completed is a reasonable period of time.

The transaxle gear ratio in the GEN3 is different than the GEN2 and either your old transaxle will need to be upgraded or a new one procured. If you plan to update your transaxle, with the new final drive ratio, you should let your rebuild shop know ahead of time. If you plan on getting another rebuilt transaxle you might want to have it in your shop before you start the conversion. The time to get the

transaxle is one of the longer lead time components that can impact the conversion time.

The wire harnesses are another time dependent step. The kit only comes with the engine and ECU harnesses and all of the remaining harnesses require modifications. Again you can upgrade of modify the old ones or buy new ones from SCCA-E. Modifying the old ones will save money but the modifications take time and special tools.

If the car doesn't have a data logger one should be considered. The ECU on the GEN3 can connect directly to most data loggers. If the car has a data logger check with the vendor's customer support to see if any special cables or interface parts are needed ahead of time.

The conversion does require aluminum and steel welding. If you are going to update your radiator holding tank it will require aluminum or TIG welding. The process can be avoided purchasing a new GEN3 tank. The steel welding (stick, TIG, or MIG) will be required to add two ground lugs.

The rear shift link will either need to be modified or replaced. If you plan on modifying the old GEN2 another welder will be necessary. It will take an Oxyacetylene torch or a tubing bender to bend the link.

There are a few other parts that might require upgrades depending on the age or status of your GEN2. The GEN 3 requires the newest alternator, the small one. The GEN3 fuel system requires a fuel pressure regulator and the in-tank fuel pump. Also, the large filler neck to fuel tank hose gets old and possibly will need to be replaced. Replacing the in-tank fuel filter, ahead of the pump, is a good idea while the fuel cell is modified. You should plan ahead if you need or think you need any of these parts.

Finally, you will need to have the software at the time you first startup the car. You can get the ECU software, PE Monitor V.XX ECU software from SCCA-E and have it loaded prior to startup day.

This up-front planning should help ensure a smooth and successful conversion.

1.3. Conversion Parts List

As stated above the conversion requires the modification of GEN2 parts or additional GEN3 parts. The following lists extra parts that are required for the conversion or might be a good idea to buy when converting.

Must Have Parts (not included in the GEN3 kit)

Part #	Description	Qty	Cost
G1190523	GEN3 STANDARD MUFFLER KIT	1	$195.00
N/A	TIE WRAP, 12" LONG	50+	-
N/A	TIE WRAP, 18" LONG	2	-
N/A	ENGINE OIL, NON-SYNTHETIC 5-20	4	-
N/A	TRANSAXLE OIL	2	-

Must Have Parts (if not already upgraded on the GEN2)

Part #	Description	Qty	Cost
591902	ADJUSTABLE FUEL PRESS	1	$196.00
G1192127	G3 ALTERNATOR KIT W PIGTAIL	1	$479.00
1150002	NEW IN TANK FUEL PUMP KIT	1	$399.80

Other Parts to Consider when Upgrading

Part #	Description	Qty	Cost

180101	DASH BOARD ONLY BLANK	1	$78.99
392601	TRANS FILL PLUG SPEED SENSOR	1	$62.79
580628	FUEL CELL OVAL GASKET	1	$13.39
591902	ADJUSTABLE FUEL PRESS	1	$196.00
598005	FUEL FILTER ELEMENT	1	$30.12
1020391	WASHER, FLAT 1/4 NYLON	26	$0.18
G112013	DATA CONNECTOR	1	Call
G1151001	GAUGE KIT	1	Call
G1190501	G3 CHASSIS HARNESS	1	$477.70
G1190502	G3 BATTERY CABLE HARNESS	1	$100.60
G1190524	GEN3 QUIET MUFFLER KIT (LAGUNA)	1	$250.00
G1192127	G3 ALTERNATOR KIT W PIGTAIL	1	$479.00
G390520A	ADAPTER, HEADDER TO MUFFLER	1	$94.30
G392547	LINK - SHIFTER REAR - GEN3	1	$67.23
G462800	GEN3 HEADER TANK W/NECK	1	$214.30
G591916	FUEL FILLER TUBE 2 1/4 X 30	1	$163.78
G592301	G3 THROTTLE CABLE	1	$129.28
G992013	SERIAL CONVERTER	1	$235.00
WM591913	FUEL FILTER - IN CELL	1	$14.00
590630	FLAPPER VALVE - FUEL SAFE 3 1/4 OD	1	$29.72
590631	FLAPPER VALVE - ATL 3 3/8 OD	1	$11.76

1.4. Required Tools

The tools required to complete this conversion are common to what it takes to perform maintenance on the SRF, Such as: motor swaps, clutch replacements, etc. The list below details non-common tools that you should have available to make this install go smoothly.

Required Tools

Tool Description	Use
30mm Socket	Rear axle nuts
8mm Allen wrench socket	Bell housing bolt at motor
#30 drill bits	For 1/8” pop rivet holes
#11 drill bits	For 3/16” pop rivet holes
.386 or “W” drill bit	#10-32 Nut-sert holes
.290 or “L” drill bit	¼-28 Nut-sert holes
10 mm Gear Wrench (Supplied with GEN3 Kit)	Used to install intake fasteners
13 mm Flex Socket (Supplied with GEN3 Kit)	Used to install right engine mount

Optional Tools

Tool Description	Use
#10-32” Nut-sert installation tool	For mounting brackets
1/4” Nut-sert installation tool	For mounting brackets
Fuel pressure gauge	Measure fuel rail fuel pressure
Leak-down gauge	Measure cylinder leak-down
Radiator vacuum bleeder	Removal of air in cooling system
Radiator leak tester	Test for leaks in the cooling system

2. Disassembly

1. Start by jacking up the car and put it on jack stands.
2. Disconnect the battery, the negative side first.
3. Remove the engine and transaxle.
4. Remove and set aside the following parts from the 1.9 L Ford engine.
   a. The complete Throttle Body with IAC (See Figure 1)

Figure 1 – Throttle Body and IAC

   b. Adjustable fuel pressure regulator; if you don't have the adjustable one it can be purchased from SCCA Enterprises or your local CSR (See Figure 2)

Figure 2 – Fuel Pressure Regulator

   c. New style Bosch Alternator; if you don't have the upgraded alternator you will need to purchase one it’s required for the GEN3 (See Figure 3)

Figure 3 – New Alternator with GEN3 Pulley

5. Remove the oil cooler, oil lines, ducting, and discard them but save the two –8 AN fittings at the top of the GEN2 oil cooler. Remove the rear panels in front of the rear wheels that mount to the frame. Save these and they will be re-installed after the oil cooler and wiring has been installed.
6. Remove the transaxle and set it aside. GEN3 specific components will be added later in the process.
7. Remove the 1.9 EFI harness, ECU, and PCU completely.
8. Keep the following wires from the distribution harness:
    d. Starter solenoid wire
    e. Main power cable from battery to master switch
    f. Starter cable from master switch to starter (will need to be shortened)
    g. The alternator wires (Two sense and one power wire)
    h. Brake/rain light wires
    i. Any wires you're unsure of the function you should leave in place
9. Remove the main battery ground wire, the battery's negative to ground, and put aside.
10. Remove the coolant recovery tank, and put aside.
11. Remove the engine bay section of the shift shaft from the linkage. Save it for later modifications.
12. Clean all the grease and grime off your chassis.
13. Inspect the frame and suspension components for defects or cracks
14. Inspect the chassis harness / alternator wiring for chaffed wires, cracked or split wires and connectors. Clean off any corrosion from the connectors and terminal ends.
15. Removing the rear suspension improves access for modifications and assembly. The following shows the frame in a state ready for modifications.

Figure 4 – Frame Stripped and Ready for Modifications

3. Pre-Assembly Preparation

3.1. GEN3 Part Finish/Paint

There are several new parts in the GEN3 conversion kit that should be painted or powder coated to prevent rust. The following list of parts should be cleaned, deburred and painted so they are dry and ready when you need them. This is also a time you might want to consider repainting some of the old parts while the car is apart.

New Parts

Part #	Description	Qty
G480507	Oil Cooler Bracket	1
G480505	Oil Cooler Fan Mounting Bracket	2
G591912	Fuel Filter Bracket	1
G1139301	Head Engine Mount	1
G591905	Fuel Regulator Adapter Bracket	1
G183002A	Oil Catch Bottle Bracket	1
G730001	Clutch Line Mounting Bracket	1

Old Parts to Consider

Part #	Description	Qty
591917	Filler Neck Bracket	1
462803	Coolant Recovery Brkt	1

Completed By: _____ Date: _____

3.2. Right Rear Engine Mount Inspection/Modification

Check the right-side frame motor mount (The one close to the cam belt): With the motor and mount removed, measure the distance from the top of the frame rail to the center of the engine mount hole. This distance should be between 1.625” and 1.75”. If it is less than this the mount will need to be removed and replaced. Two new mounting brackets (Part # 391307) can be installed by a CSR or anyone with the ability to weld steel. (See Figure 5)

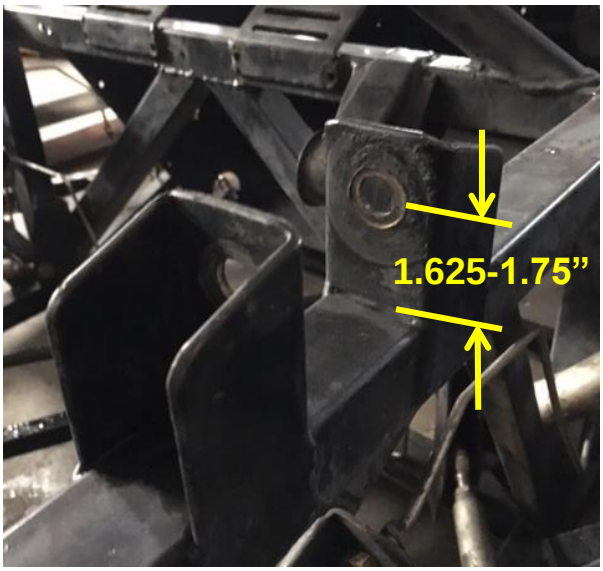

Figure 5 – Right Side Motor Mount

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3.3. Ground Lug Bosses Frame Modifications

The frame has always been used as a ground path between the battery and engine. However, in this GEN3 application it is even more critical to establish a good low resistance ground path. The ground path from the engine to the battery helps the starter maintain a constant RPM, which is important for hot and cold starting consistency. This section will add two ground lug bosses to the frame.

Battery Ground Boss

1. Locate the 1.5” square tube across from the battery (See Figure 6).

Figure 6 – Battery Ground Boss Location

2. Remove paint or powder coat to ensure a clean ground connection.
3. Drill a 5/8” diameter hole in the center of the outside face of the 1.5” x 1.5” tube approximately 6.5” up from floor level.

4. Weld the boss (Part # G183001) to the frame and paint to match.

Transaxle Ground Boss

5. Locate rearward angled 1”x1” tube just forward of the gearbox.

Figure 7 – Transaxle Ground Boss Location

6. Drill a 5/8” diameter hole in the center of the tube approximately 6” down from main tube across from gearbox sheet metal cover.
7. Remove all paint or powder coat and degrease
8. Weld the boss to the frame. (See Figure 7)

Completed By: _____ Date: _____

3.4. Coolant Tank Modifications

If you chose to update the cooling system fill / surge tank, clean and inspect for damage before beginning this update. A new tank can be bought with these fittings already installed (Part # G462800) or your local CSR can make these updates for you. (See Figure 8)

Figure 8 – Un-modified GEN2 & New GEN3 Coolant Tank

The following is the procedure to modify the GEN2 tank if you don't have a new one.

1. Cut off the -8 male fitting nearly flush with the body and weld the -6AN male fitting supplied in the kit. (Part # G691931)
2. Drill a .8125" hole with a uni-bit approximately .75" above the bottom of the tank and 1.5" from the edge on the same side as the -6 fitting. Weld the modified -8 fitting (part # G462801) in this location.
3. Use the supplied cap (Part # G691933) for the lower fitting that has been eliminated. This can be cut off and a plate welded over it instead of using the cap.

Completed By: _____ Date: _____

3.5. Shifter Shaft Modifications

The rear GEN2 shift shaft must either be modified or replaced with a new one. A new pre-bent shift shaft can be ordered from your CSR (Part # G392547) or modify the old GEN2 shaft to the following dimensions.

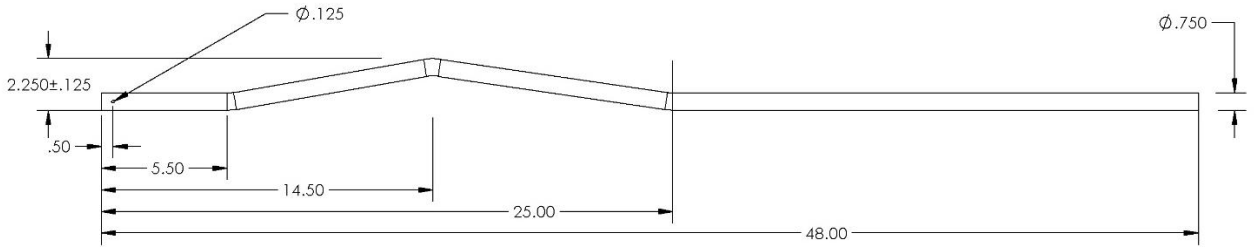


Figure 9 – Shift Shaft Modifications

Completed By: _____ Date: _____

3.6. GEN2 Catch Tank Modifications

The coolant catch tank has to be moved from the left side of the car to the right side. This is to keep it away from the electronics.

Part #	Description	Qty
1001835	POP RIVET 1/8 X 3/16 ALUM	6
N/A	TIE WRAP 18" LONG	2

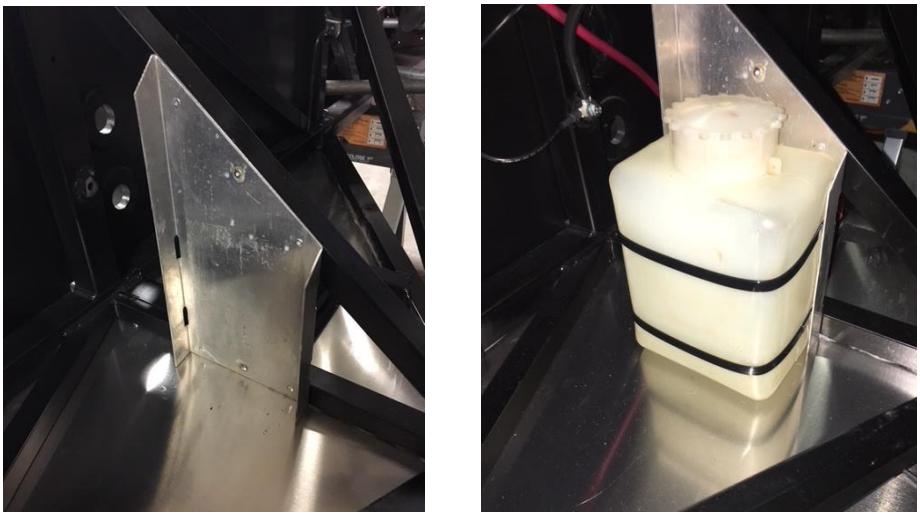


Figure 10 – New Coolant Catch Tank Location

1. Install on front of RH side pod about the same position of the 1.9 ECU mount with the supplied 1/8” rivets (Part # 1001835). (See Figure 10)
2. Install reinstall the coolant catch can with two 18” or larger tie-wraps, not included in the kit.

Completed By: _____ Date: _____

3.7. Transaxle Preparation

The GEN3 uses the same gearbox as the 1.9 L engine with four modifications.

Transaxle Guide Tube Removal

1. Locate the two-locating guide tube/pins in the transaxle, if any remain. They might still be attached to the old engine block.
2. Remove the locating pins and discard them. New locating dowels are pre-installed in the transaxle adapter plate.

Transaxle Mounting Hole Modification

3. Use Figure 11 to locate the hole to be drilled. The hole is at about the 4:00 position when looking at the inside of the clutch housing.

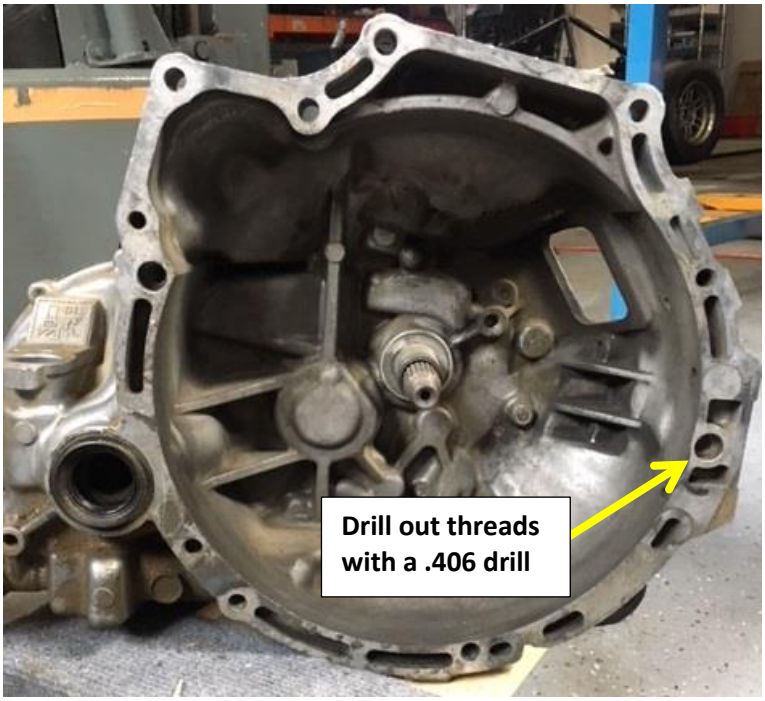


Figure 11 – Transaxle Mounting Hole Modification Location

4. Using a .406” or 13/32” diameter drill bit, drill the threads out all the way through. This is to allow a bolt to be installed from the transaxle side and not the engine side as in the GEN2.

Transaxle Clutch Release Bearing Modification

The GEN3 kit uses a hydraulic throw-out (T/O) bearing and Tilton clutch assembly. The next set of steps detail the prep work for this new throw-out bearing within the existing transaxle.

5. Locate the base of the T/O bearing guide tube and make sure it is smooth and burr free. (See Figure 12) Use emery cloth or similar to remove any fine burs or nicks.
6. The new Tilton release bearing assembly has an O-ring in the inner diameter (I.D.) of the assembly body to help dampen and let it float on the T/O bearing guide tube.

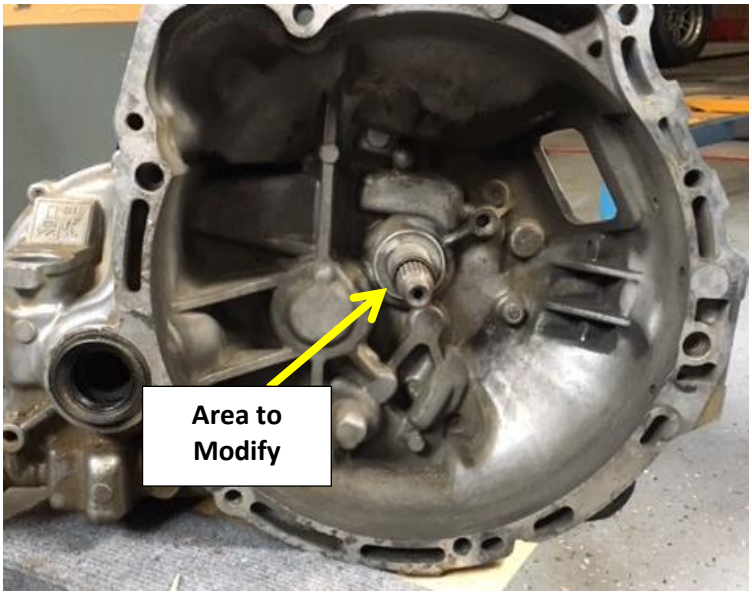


Figure 12 – Transaxle Mounting Hole Modification

7. Look closely at the base of the guide tube, there is a machined ring around the base of the tube. There is a small bur or un-machined edge around the outer diameter of the machined ring. Using a small file and/or emery cloth remove this un-machined edge carefully so the release bearing body sits flat against the machined ring on the gearbox case. Clean the tube before installing the T/O bearing.
8. Once cleaned up, lube the guide tube and O-ring with thin grease and slide release bearing assembly on the guide tube. The fit of the T/O bearing assembly on the guide tube will be tight and will require force to install.

Clutch Throw-out Bearing Installation

9. Locate the following lines and hardware.

Part #	Description	Qty	Notes
G691803	-3AN LINE FEMALE	1	
G691804	-3AN LINE FEMALE CLUTCH BLEEDER	1	
G730001	CLUTCH LINE MTG PLATE	1	
1000414	WASHER, 3/8 FLAT	2	Not Supplied
G1010005	BOLT, FLANGE HD M8-1.0 X 16	2	
WM1010376	-3AN STRAIGHT BULKHEAD	1	
WM802008	-3 TO -3 UNION	2	
1000380	NUT, 3/8-24 JAM	1	

10. Attach the clutch line mounting plate (Part # G730001) to the transaxle using the M8 flanged bolts (Part # G1010005). Leave them hand tight until all the lines and throw-out bearing is installed. (See Figure 13)

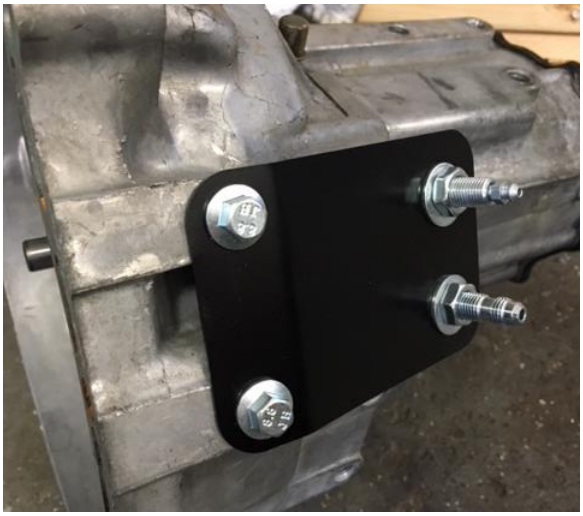


Figure 13 – New Clutch Fittings

11. Attach the -3 bleeder line to the upper hole and the -3 standard line to the lower hole in the clutch line mounting plate and on the throw-out bearing body.

Figure 14 – Throw-out Bearing Sub-Assembly

12. Install two 3/8 washers (Part # 1000414) and two 3/8-24 nuts (Part # 1000380). When done installing the lines, tighten all fittings and hardware. (See Figure 13)

Figure 15 – T/O Bearing & Clutch Lines

Clutch Fluid Line Modification

The clutch line from the bulkhead fitting on the car to the transaxle requires modification at one end. This is optional but provides a cleaner installation by adding a 90° fitting in place of the straight one.

Part #	Description	Quantity
G602012	-3 90DEG TO -3 SS HOSE	1

Remove the SS braded clutch slave cylinder hose from the car (part #680418). Shorten the clutch hose to 10". Push on the -3 90 deg. to -3 hose fitting (Part # G602012) into the cut hose and clamp down the ferrule nut. The line can then be put back on the car with the straight fitting attached to the chassis.

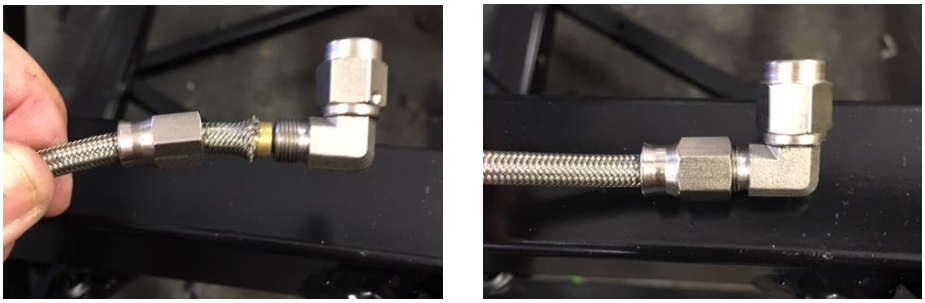


Figure 16 – Modified Clutch Slave Cylinder Hose

Completed By: _____ Date: _____

4. Sub-Assembly Builds

The following sub- assemblies can be assembled prior to the final or engine installation. Most of these can be completed before the GEN2 is disassembled.

4.1. Oil Cooler Sub-Assembly

The 1.6 L will use larger oil cooler with a temperature activated fan. The following parts will be required for this sub-assembly.

Part #	Description	Qty
1000106	BOLT, HEX 1/4-20 X .5	3
1000364	NUT, HEX 1/4-20	4
1000410	WASHER FLAT, 1/4	5
G1010050	BOLT, HEX 1/4-20 X 1.5	1
1016244	WASHER, FLAT #10	4
1080606	NUT, NYLOCK #10-32	4
G480503	G3 OIL COOLER	1
G480504	OIL COOLER FAN	1
G480505	OIL COOLER FAN MOUNT	2
G480506	OIL COOLER FAN SPACER	1
G480507	OIL COOLER BRKT	1
G1010045	WASHER, #10 RUBBER	4
G1010046	SCREW, PH #10-32 X .75	4

1. Assemble the two oil cooler fan mounts (Part # G480505) to the fan (Part # G480504) using the following hardware. Insert the #10 pan head screws (Part # G1010046) into the oil cooler fan mounts, then install one #10 rubber washer (Part # G1010045) per screw, then insert the screws through the holes in the fan.

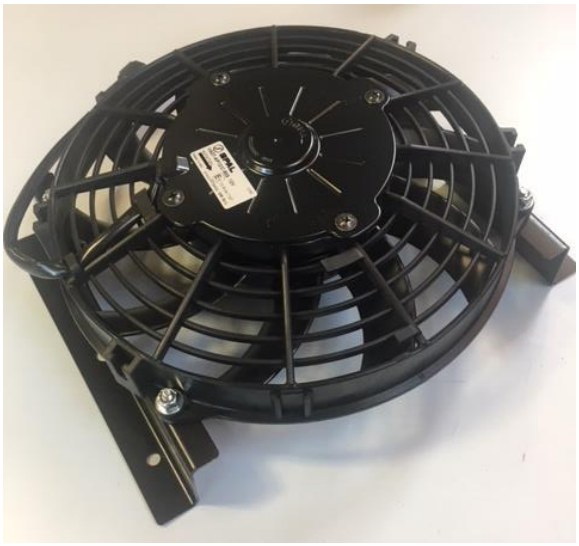


Figure 17 – 1st Fan Assembly Step

2. After installing the fan mounts to the fan, add another rubber washer to the screws, add #10 washers (Part # 1016244) on top of the rubber washers, and finally add #10 nylock

nuts (Part # 1080606) to the screws. Tighten these before mounting to the oil cooler in the next steps. (See Figure 17)

3. Now place the mounted fan sub-assembly to the oil cooler with the wires pointing to the top or the fitting side of the cooler.

Figure 18 – 2nd Fan Assembly Step

4. Install the “Z” shaped oil cooler bracket (Part # G480507) to the other side of the oil cooler and bolt all three of them together with the following hardware. Insert two 1/4” bolts (Part # 1000364) through the mounting holes, add two 1/4” washers (Part # 1000410), and secure them with 1/4“ nuts (Part # 1000364).

Figure 19 – 3rd Fan Assembly Step

5. At the lower end of the fan insert the long 1/4” bolt (Part # G1010050) through the fan mount and oil cooler and then the install the oil cooler fan spacer (Part # G480506) and secure it with a 1/4” nut until ready to mount to the frame.

Completed By: _____ Date: _____

4.2. Air Cleaner Sub-Assembly

The GEN3 has a remote air cleaner with a reusable air filter. The following parts will be required for this sub-assembly.

Part #	Description	Qty
1000101	SCREW, BHS 1/4-20 X .625	2
1000410	WASHER FLAT, 1/4	2
1090095	HOSE CLAMP #40 2.06"-3.0"	1
1090096	HOSE CLAMP #48 2.5"-3.5"	1
G301022	GEN3 OIL FILTER	1
G592230	AIRADE AIRBOX & TUBE	1
G592230-7	POP RIVET 1/8" .313"-.375" GRIP ALUM	2
G592230-8	HOSE CLAMP #52 2-13/16" to 3-3/4"	1
WM301020	AIR FILTER, GEN 3 FOAM	1

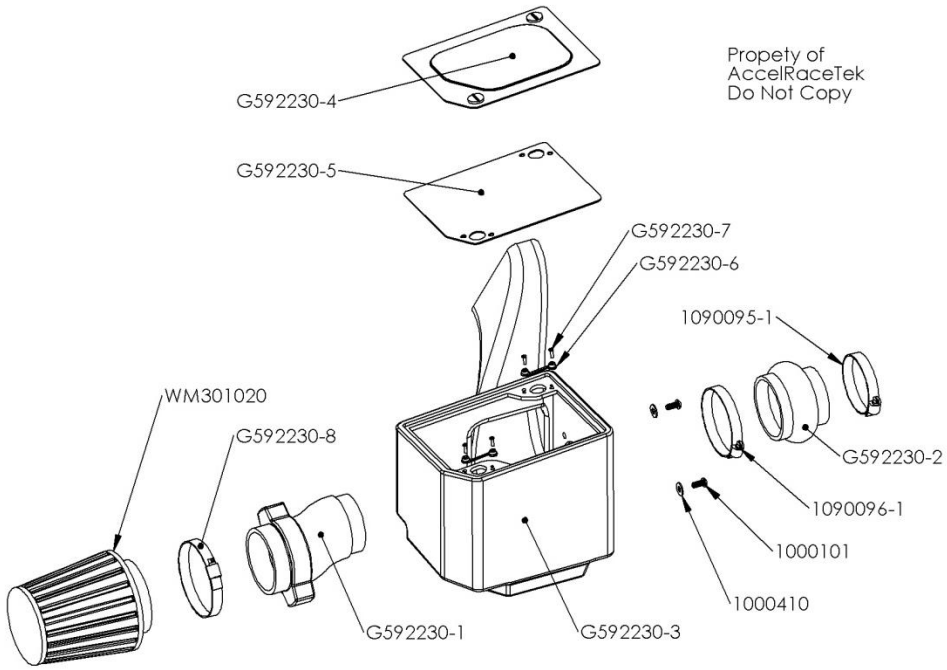


Figure 20 – Air Cleaner Sub-Assembly Exploded View

1. Pop rivet the spring clamps (part #592230-6) to the air box (part #592230-3)
2. Install the air box tube to the main box using the 1/4 inch button head screws and washers as shown in the exploded view.
3. Install the air cleaner inside the box with the large hose clamp (part #592230-8)
4. Attach the flex coupling (part #592230-2) to the air box tube.
5. Install the gasket and cover using the 1/4 turn fasteners attached to the cover
6. The sub-assembly is now ready and can be put aside until ready.

Figure 21 – Air Cleaner Sub-Assembly & Pop Rivets

Completed By: _____ Date: _____

4.3. Fuel Pressure Regulator Sub-Assembly

The GEN3 will use the adjustable fuel pressure regulator off of the 1.9 L engine or purchased new, if not on the GEN2.

Part #	Description	Qty
G591904	FUEL REG ADAPTER	1
G591905	FUEL REG ADAPTER MOUNT	1
G691937	-6 MALE TO 9/16-18 O-RING	2
G980495	OEM GM PSI SENSOR FUEL/OIL	1
G1010026	SCREW, BHS #10-24 X 1/4	2
WM1010174	SCREW, SHCS M5-.8 X 20	3

1. Carefully de-burr the O-ring hole in the adapter block where it receives the O-ring on the Fuel PSI regulator. Make sure it is clean before proceeding.
2. Attach the fuel pressure regulator to the adaptor block using the supplied hardware. (Part# WM1010174). Install the small gasket between the regulator and the block. Be careful not to damage the sealing O-ring.
3. Attach the fittings (Part # 2x G691937) and sensor (Part #G980495) to the adaptor block.
4. The sub-assembly is now ready and can be put aside until ready.

Figure 22 – Fuel Pressure Regulator

Completed By: _____ Date: _____

4.4. ECU Mounting Bracket Sub-Assembly

The new ECU (Engine Control Unit) mounts on drivers LEFT side of the chassis under the front edge of the side pod. This bracket assembly will be installed later in the process.

1. Locate the following parts and hardware.

Part #	Description	Qty
1000364	NUT, HEX 1/4-20	3
1020392	WASHER, FLAT 1/4	3
1002068	POP RIVET 1/8 X 3/8 STEEL	5
1090021	ZIP TIE 14"	4
G392004	ECU BRKT 2.5"	1
G392003	ECU BRKT 5"	1
G1010001	STUDDED RUBBER MOUNT	3
G1010030	VELCRO LOOP	A/R

2. Outside of the car, assemble part # G392004 ECU BRKT 2.5" and part # G392003 ECU BRKT 5" using the hardware, and rubber standoffs. Assemble them loosely as shown in Figure 23.

Figure 23 – ECU Mounting Plate Assembly

Completed By: _____ Date: _____

4.5. Fluid Line Build

The GEN3 kit comes with the fittings and line to build the necessary fuel, oil, vent, and water lines. The use of braided or other type of hose or ends is up to the owner.

Fuel Lines Parts List

Part #	Description	Qty
691921	-6 45 DEGREE FITTING	3
691903	-6 90 DEGREE FITTING PUSH ON	4
698001A	-6 FUEL HOSE PER INCH	68
G691941	-6 120 DEGREE PUSH ON	1

Fuel Lines Connections

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
26“	-6 120° to Hose	Fuel filter out	-6 90° to Hose	Injector rail – Driver side
20”	-6 45° to Hose	Fuel cell out	-6 45° to Hose	Fuel filter inlet
16”	-6 90° to Hose	Fuel regulator outlet	-6 90° to Hose	Fuel cell return
12.5”	-6 45° to Hose	Right side - Injector rail	-6 90° to Hose	Fuel regulator inlet

4.6. Oil Lines

Oil Lines Parts List

Part #	Description	Qty
G691925	-8 X 120 DEG PUSH ON	2
692410	-8 90 DEGREE FITTING PUSH ON	2
698002A	-8 OIL HOSE PER INCH	75

Oil Lines Connections

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
34”	-8 120° to Hose	Block adaptor	-8 90° to Hose	Oil cooler
41”	-8 120° to Hose	Block adaptor	-8 90° to Hose	Oil cooler

4.7. Coolant Lines

Water Lines Parts List

Part #	Description	Qty
G691926	-4 HOSE PER INCH	10
G691927	-4 FEM TO 1/4 HOSE PUSH ON	2
691903	-6 90 DEGREE FITTING PUSH ON	1
691921	-6 45 DEGREE FITTING	1
691928	-6 STRAIGHT FEMALE PUSH ON	4
698001A	-6 FUEL HOSE PER INCH	30
680800	-8 STRAIGHT FITTING	1
698002A	-8 OIL HOSE PER INCH	33

692410	-8 90 DEGREE FITTING PUSH ON	1

Water Lines Connections

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
10”	-4 to Hose	-4 Engine Head	-4 to Hose	Tee
17”	-6 to Hose	Filler tank	-6 to Hose	Tee
6”	-6 90° to Hose	-6 Engine Head	-6 to Hose	Tee
7”	-6 45° to Hose	-6 on lower radiator tube	-6 to Hose	Floating drain hose
33”	-8 90° to Hose	-8 on thermostat plate	-8 to Hose	Tank to lower radiator hose adaptor

4.8. Vent Lines

Vent Line Parts List

Part #	Description	Qty
G691945	-12 30 DEGREE PUSH ON	2
WM1010323A	-12 OIL HOSE PER INCH	19

Vent Line Connections

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
19”	-12 30° to Hose	Engine block vent	-12 30° to Hose	Oil breather tank

Completed By: _____ Date: _____

5. Pre-Engine Assembly

5.1. In Tank Fuel Pump Upgrade

If the car needs upgrading to the new in tank fuel pump it needs to be completed before going any further. If the new pump is already installed go to the next step "Fuel Filler Neck Modification". The instructions for the in-tank fuel pump can be found on the SCCA-E web-site.

5.2. Fuel Tank Modification

Filler neck on the fuel tank needs to be rotated for the GEN3 application. This modification is required to give clearance between the fuel filler hose and the oil filter on the front side of the engine. To make this modification you will need the following parts.

Required

Part #	Description	Qty
580627	ROUND FUEL CELL GASKET	1

Recommended

Part #	Description	Qty
WM591913	FUEL FILTER - IN CELL	1
580628	FUEL CELL OVAL GASKET	1
591916	FUEL FILLER TUBE 2 1/4 X 30	1
1020391	WASHER, FLAT 1/4 NYLON	12 or 25

Fuel Neck Modifications Procedure

1. Remove the fuel lines that go to the engine if not already removed. It is a good practice to cap the -6 AN fittings with caps until the new lines are installed.
2. Remove the filler hose, the 1/4 - 28 bolts from the filler neck plate, and remove the aluminum hose adapter. Consider replacing the internal fuel filter at this time and checking inside the fuel cell. To access the filter, it requires the removal of the oval plate. It is also is recommended that all the 1/4 nylon washers be replaced at this time.

Figure 24 – Example of Dirty In-tank Filter

3. Reassemble the aluminum hose adapter with a new gasket (Part # G591916) about 45º off vertical (See Figure 25). The hose will curve down to within about 1” to 2” above the level with the floor.

4. The filler hose gets stiff with time and might be too short, if necessary replace it at this time. Reattach the filler hose to the aluminum hose adapter and tighten the hose clamp.

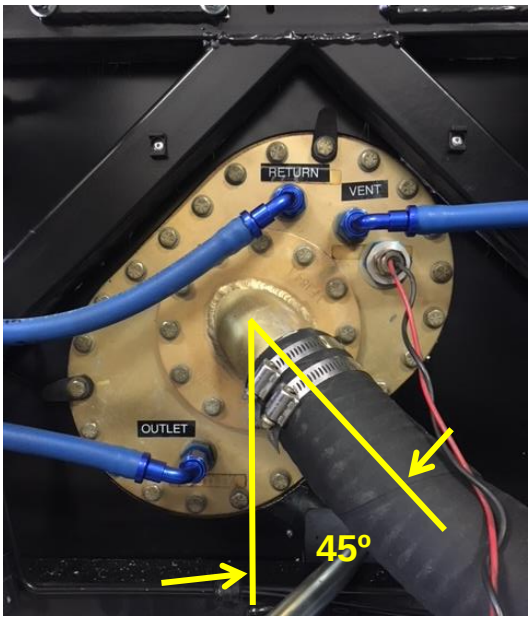


Figure 25 – Filler Neck Angle

Completed By: _____ Date: _____

Fuel Pump Connector Conversion

The connector might need to be changed for the conversion. Cut off the old connector close to the GEN2 connector. Strip the wires and crimp the new connector pins to the wires. The crimps require a special crimp tool. If the crimp quality is poor it is recommended that the pins be soldered to the wire. The pump connections have polarity and must be installed correctly. Insert the pins into the connector body in the correct orientation. The connections are show below.

Connector	Pins	Connection	Length
C1-Femal	2	Rear ECU wire harness connector	N/A
Blue	1	Positive connection	
Black	2	Negative connection	
C1-Male	2	Fuel pump connector	
Red	1	Positive connection	+10”
Black	2	Negative connection	+10”

5.3. Fuel Filter Installation

The fuel filter position is different with the GEN3. The old filter bracket is replaced with a new one.

Part #	Description	Qty
992006	FOAM	1
1016244	WASHER, FLAT #10	2
G591912	FUEL FILTER BRACKET	1
G1010048	NUTSERT, #10-32	2
G1010049	SCREW, BHS #10-32 X .50 SS	2

1. Position the fuel filter bracket (Part # G591912) on the left rear frame tube 14" from the rear cross tube to the center line of the filter). Mark and then drill holes for the nut-serts (Part # G591912). Install the nut-serts with a tool or if you don't have a nut-sert tool stack up some #10 washers and use a #10-32 socket head screw to collapse the nut-sert on the frame rail, a little grease will help.
2. Install the bracket with the #10 stainless steel button head screws (Part # G1010049) and washers (Part # 1016244).

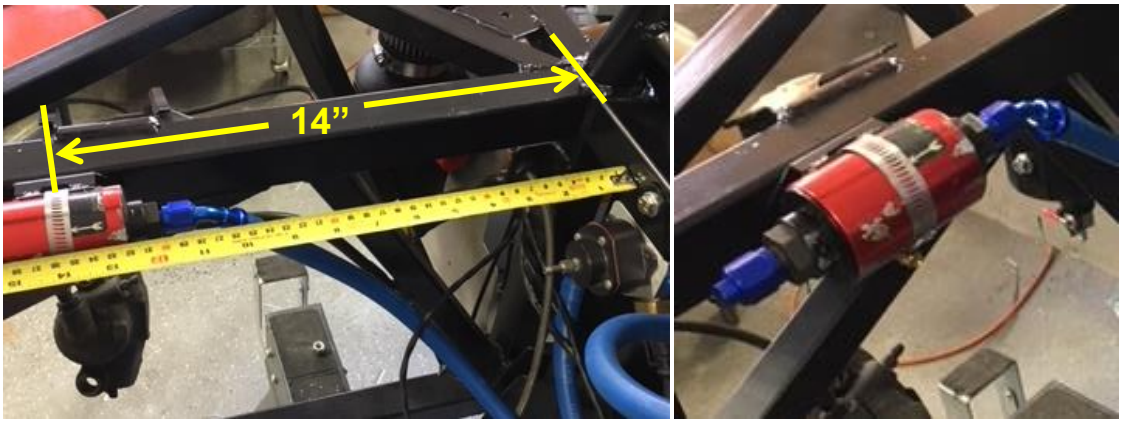


Figure 26 – Fuel Filter Bracket Location

Completed By: _____ Date: _____

5.4. Fuel Pressure Regulator Installation

Locate the GEN3 fuel pressure regulator assembly that was built up in a prior step. The fuel pressure regulator assembled is mounted inside the engine compartment on a 1.5" square tube.

Part #	Description	Qty	Notes
1000100	BOLT, HEX 1/4-20 X .5	1	
1020380	WASHER, LOCK 1/4	1	
G1010047	NUTSERT, 1/4-20	1	
N/A	FUEL PRESSURE REGULATOR ASSY	1	Assembled earlier

1. Position the fuel pressure regulator assembly about 3-1/4" to the right of the left upper corner. Mark and drill holes for the nut-sert (Part # G1010047). Install the nut-sert with a tool or if you don't have a nut-sert tool stack up some 1/4 washers and use a 1/4-20

socket head screw to collapse the nut-sert on the frame rail, a little grease will help.

2. Install the fuel pressure regulator assembly with a 1/4-20 X .5” hex bolt (Part # 1000100) and washer (Part # 1020380).

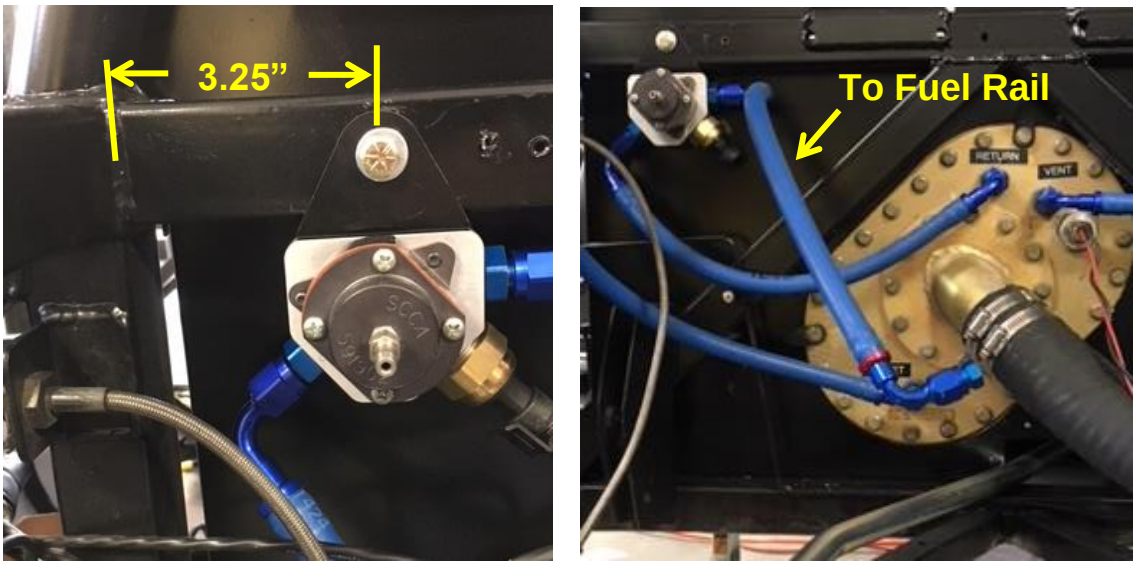


Figure 27 – Fuel Pressure Regulator Mounting

Completed By: _____ Date: _____

5.5. Oil Cooler Installation

Locate the oil cooler assembly built in a previous step. The new fan cooled filter will mount in the same location as the GEN2 but with different mounting holes and hardware.

Part #	Description	Qty	Notes
1000106	BOLT, HEX 1/4-20 X .5	2	
1020380	WASHER, LOCK 1/4	3	
G1010047	NUTSERT, 1/4-20	3	
G1010050	BOLT, HEX 1/4-20 X 1.5	1	
N/A	OIL COOLER FAN ASSY	1	Assembled earlier

1. Remove the right-side pod panel if not already removed.
2. Place the oil cooler assembly in the chassis and position the cooler until the lower mounting location lies up over the diagonal bar and is centered vertically on the top bar. Mark the hole locations and remove the assembly.
3. Drill the holes for the nut-serts (Part # G1010047). Install the nut-sert with a tool or if you don’t have a nut-sert tool stack up some 1/4 washers and use a 1/4-20 socket head screw to collapse the nut-sert on the frame rail.
4. Install the oil cooler assembly with a 1/4-20 X 1.5” hex bolt (Part # G1010050) in the lower hole, two 1/4-20 X .5” hex bolt2 (Part # G10100106), and three washers (Part # 1020380).
5. The fan wiring harness will be installed later.

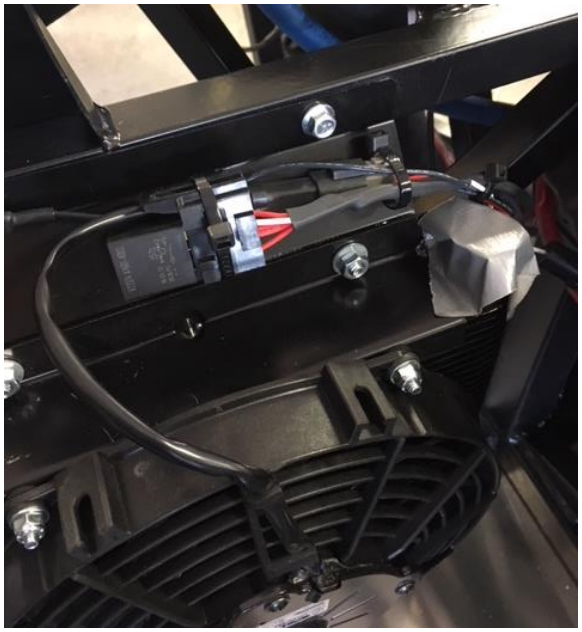


Figure 28 – Oil Cooler Assembly Installation

Completed By: _____ Date: _____

5.6. Breather Bottle Installation

The GEN3 uses a new breather system that is vented to open air. Because of this, at the end of a session it's possible to see some vapor or smell a hot oil type odor.

Part #	Description	Qty
1000100	BOLT, HEX 1/4-20 X .5	2
1020380	WASHER, LOCK ¼	2
1020392	WASHER, FLAT 1/4	2
1090099	POP RIVET 3/16 X 3/8 STEEL	2
G183002A	CATCH BOTTLE BRACKET #2	1
G391505	OIL BREATHER TANK W/FILTER	1

1. Remove the left side pod panel if not already removed.
2. Temporarily assemble the catch bottle bracket (Part # G183002A) to the oil breather tank (Part # G391505) using the hardware supplied (Part # 100380, 1000100, 1020392, & G391505).
3. Position the catch bottle bracket to the diagonal 1"x1" tube such that the filter does not stick above the 1"x1" frame tubes and so that the output -12 fitting clears the main water tube. Mark the position of the mounting holes and remove the assembly. Screw the hardware back into the catch bottle (without the bracket) and put it to the side to install at a later time.
4. Drill the holes with a #11 drill bit for the 3/16" pop rivets (Part # 1090099). Remove the tank from the bracket and pop rivet the bracket to the frame.

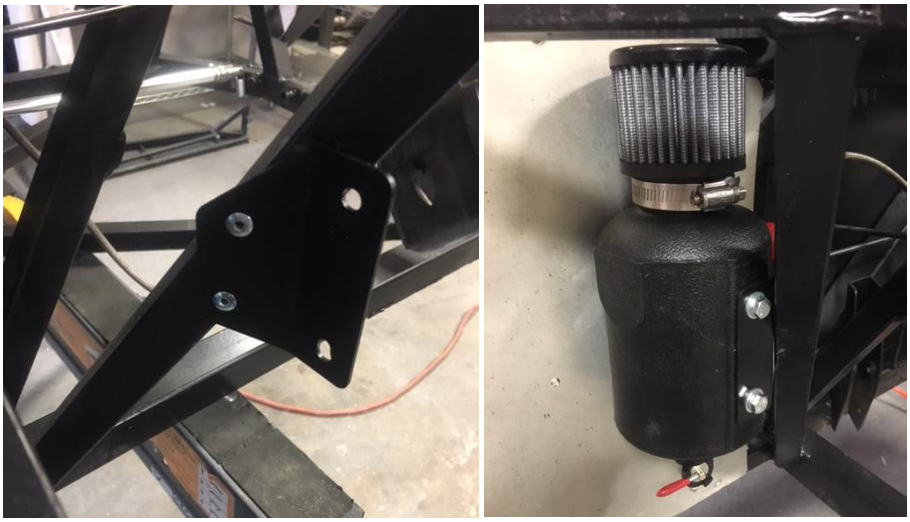


Figure 29 – Breather Bottle Mounting

Completed By: _____ Date: _____

5.7. Ground & Power Cable Modifications

The ground and battery power cables are different for the GEN3. The cables can be modified of new ones can be purchased. If you have a new battery cable assembly (part #G1190502), skip this modification step.

Part #	Description	Qty
G991818	GROUNDING LUG #6 X 5/16	5
G1010041	3/8 HEATSHRINK	8”

Figure 30 – Modified Ground and Battery Cable

Black/Ground Wire Modifications

1. Remove all of the old tape holding the GEN2 battery wire harness together and clean all

the wires.

2. Cut 2 lengths of the black/ground cable, from the GEN2 cable, to a length of about 13” discard the remaining black wire.
3. Install two pieces of 3/8” heat shrink (part # G1010041) tubing about 1.5” long onto each cable.
4. Crimp the new lugs (part # G991818) onto both ends of the wires. It is a good practice to solder the lugs to the wire after crimping.
5. Use a heat gun to shrink the tubing and seal the ends of the wire.
6. The main battery red cable running from the battery to the master switch hot side does not require modifications and will be use as is.

Red/Power Wire Modifications

The starter and solenoid cable need to be shortened to accommodate the new starter location.

7. Cut down the red starter cable, from the GEN2 cable, to a length of about 24” discard the remaining starter red wire. Use the end with the 3/8” lug, one will be reused.
8. Install one piece of 3/8” heat shrink (part # G1010041) tubing about 1.5” long onto the cable.
9. Crimp a new lug (part # G991818) onto the bare end of the wires. It is a good practice to solder the lugs to the wire after crimping.
10. Use a heat gun to shrink the tubing and seal the wire.

Completed By: _____ Date: _____

5.8. Instrumentation

It is assumed that a modern data logger will be used with the GEN3 but if not, an optional gauge fitting kit can be purchased.

For those that prefer traditional analogue gauges, you can use a similar setup as the 1.9. New Autometer Oil PSI / Water Temp Gauges kit (part # G1151002) The sending units can be added with Optional Gauge fitting kit (Part #G1151001) provides sending unit adaptors for both oil pressure and water sending units. The oil pressure adaptor mounts on top of the inner oil cooler/oil line fitting. The water sensor mounts to a "Tee" fitting installed in the by-pass water bung on the radiator hose adaptor. (end of the cylinder head) The ECU provides a traditional "TACH" signal wire for interfacing with a traditional analogue gage. It is a square wave that varies as a function of RPM, 2 pulses per revolution.

The GEN3 ECU provides data in multiple formats. The ECU can supply data in the following format: PE standard CAN data protocols and a streamlined Bosch Motorsport 4.3 Protocol. Both will provide engine parameters to many of today's data systems. The following are two data systems that work well with the GEN3 and are supported by both the data logger vendor and SCCA-E.

Competition Data System

Competition Data Systems has a data system that will interface with the GEN3 ECU via the interface module using "CAN" protocol. This system is plug-n-play.

Follow the instructions that came with your CDS to establish connection with the car and verify the system is operating before proceeding. (i.e. verify that your "live" readings make sense on items like water temp and air temp).

AIM Data System

AIM Data Systems will interface with the GEN3 ECU using the "CAN" protocol. A schematic of the connection to the AIM system is in the Appendix. The is also an interface cable that will help with the installation, available from SCCA-E or your CSR.

5.9. Dash Updates

The GEN3 adds an ECU code light, pit speed limiter, and a rain map switch/light to the existing dash. The ECU light will flash trouble codes similar to an OEM check engine light. The rain map switch tells the ECU to use an alternate program for less torque in the 3000 to 5000 RPM range for more control. The pit speed limiter will active secondary rev and fuel limiter in any gear based on the speedo drive pulse generator on the gearbox. (This requires the transaxle speed gear assembly) The dash sub harness from the ECU is set to mount the new lights and switches per "Dash Layout template" included in the kit. The dash is connected via two harnesses, the Dash Harness that comes from the ECU (on the left side) and the Chassis Harness that runs back to the engine bay (on the right side of the car).

GEN3 Dash Harness Installation – ECU Side

The following procedure describes the installation process for the Dash Harness.

New Parts from Kit

Part #	Description	Qty
G90501	GEN3 DASH HARNESS	1

G980476	DASH SWITCH - RAIN MAP/PIT SPEED	2
G980480	GREEN DASH LIGHT	1
G980480B	BLUE DASH LIGHT	1

Parts from GEN2

Part #	Description	Qty
980481	STARTER SWITCH	1
980475	IGNITION SWITCH GUARD	1
980476	IGNITION SWITCH - IGNITION	1
180101	DASH BOARD ONLY BLANK	1

1. Locate the new lights and switches in your dash per the provided template. Drill appropriate holes and installed new lights and switches with supplied hardware.
2. Connect the dash harness following the schematic in Figure 31.
3. If you choose not to connect any of these, isolate the wires and protect them from shorting to each other or the frame. Rain map light/switch and pit speed limiter are not required for ECU to function.

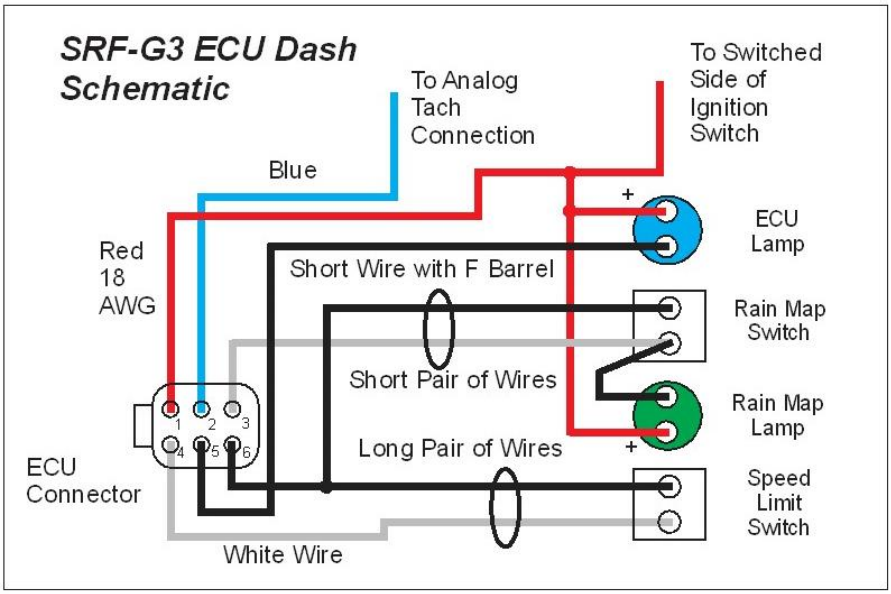


Figure 31 – Dash Wiring – ECU Connections/Side

5.10. GEN2 Chassis Harness Modifications Procedure

Skip this section if a new Chassis Harness was purchased.

Some of the connections and wire on the old GEN2 hardness are not required for the GEN3. Most of the engine sensors are connected into the ECU with the engine wire harness. The following functions and wires are not required and can be either cut off or removed.

Obsolete Functions/Wires – Dash of Harness

Color	Size	Connector	Function	Notes
Lt Green	18	Spade Lug	Water temperature gauge	
Red	18	Spade Lug	Water temperature gauge 12 volts	
Black	18	Spade Lug	Water temperature gauge ground	
Lt Brown	18	Spade Lug	Oil Pressure gauge	
Lt Blue	18	Spade Lug	Tachometer gauge	
Red	18	Spade Lug	Tachometer gauge 12 volts	
Black	18	Spade Lug	Tachometer gauge ground	

Obsolete Functions/Wires – Engine End of Harness

Color	Size	Connector	Function	Notes
Lt Green	18	Spade Lug	Water temperature sensor	
Lt Brown	18	Spade Lug	Oil Pressure sensor	
Black	14	1/4” Ring Lug	Alternator ground	

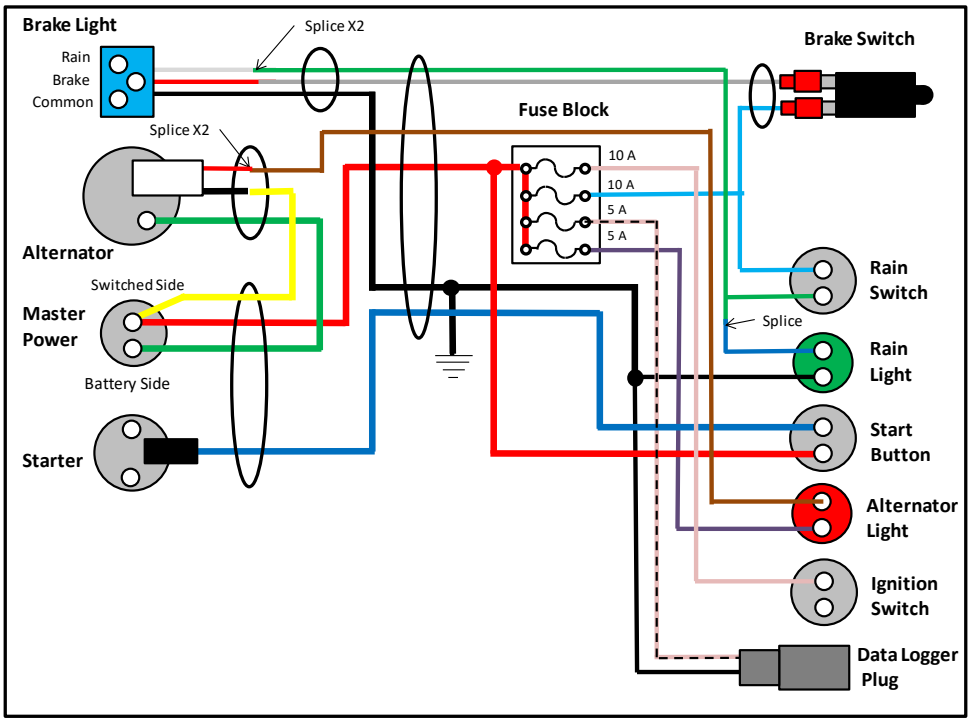


Figure 32 – Chassis Harness Schematic

Retained GEN2 Dash End Connections

The following functions and wires are required for the GEN3. Some of the wires will need to be modified for the GEN3.

Color	Size	Connector	Function	Other
Pink	18	#8 Ring Lug	IGN switch from Fuse panel	10 Amp
Blue	18	#8 Ring Lug	Rain light switch from Fuse panel	10 Amp
Green	18	#8 Ring Lug	Rain light from rain light switch	
Blue	18	.25” Spade	Brake light switch from Fuse panel	
Grey	18	.25” Spade	Brake light from brake light switch	
D Blue	18	F Bullet	Alternator charge light from fuse panel	5 Amp

Brown	18	F Bullet	Charge bulb to alternator “T” plug	
Red	12	#10 Ring Lug	Starter switch from master switch	Not Fused
D Blue	12	#10 Ring Lug	Starter switch from starter switch	
Black	12	5/16 Ring Lug	Ground to battery ground lug on frame	

Data Logger Plug

Color	Size	Connector	Function	Notes
Red	18	Spade Lug	Old oil pressure gauge 12 volts	Now the data logger 12V
Black	18	Spade Lug	Old oil pressure gauge ground	Now the data logger ground

Retained GEN2 Engine End Connections

The following functions and wires are required for the GEN3. Some of the wires will need to be modified for the GEN3.

Alternator

Color	Size	Connector	Function
Red	18	T1	Battery side of master to charge light
Black	18	T2	Brown field charge from the dash charge light
Green	12	1/4” Ring Lug	Alternator output stud to Master switch

Starter

Color	Size	Connector	Function	Notes
D Blue	12	1P Packard	Starter Solenoid from starter switch	Needs to be cut shorter

Brake light connector

Color	Size	Connector	Function
White	18	P1	Splice to black to chassis ground eyelet
Red	18	P2	Splice to grey to brake light switch
Black	12	P3	Splice to green to rain light switch

Master Switch

Color	Size	Connector	Function
Yellow	18	3/8” Ring Lug	Switched side of master to Alternator
Red	12	3/8” Ring Lug	Switched side of master to fuse panel
Green	12	3/8” Ring Lug	Battery side of master to Alternator

Completed By: _____ Date: _____

5.11. Wire Harness Installation

ECU Harness Installation

1. Place three to four Tie-Wrap Tabs (Part# G1010038) evenly spaced on the both the right side 1.5x1.5” main frame rails. (See Figure 33) Drill holes with a #30 bit and pop rivet them in place using 1/8” aluminum rivets (Part# 1001835). The exact location of these tabs is not critical. The use of these is suggested and if you have another method for strain relieving and routing that is allowed.

Figure 33 – Tie-Wrap Tab Mounting at Center Section

2. Route the ECU harness along the drivers left side upper 1.5” square tube where the Ty-Wrap tabs have been installed. Use tie-wraps to attach the ECU cable starting with the ECU end. It is recommended to not fully tighten the tie-wraps until the ECU has been installed.
3. It’s a good idea to add clearance the upper right corner on the left side pod panel, so you don’t cut the harness on the edge of the panel.

ECU Mounting

1. The ECU and Wide Band Air Fuel system mounts to the underside of this assembly using the supplied Velcro. Ty-Wraps are used to secure the unit to the mounting plate.

Figure 34 – ECU, Relay, and Wide Band Mounting (Underside View)

2. Fit this assembly into the left side pod and hold or clamp into place. Mark the location of the 1/8” rivet holes, remove the assembly and drill the holes using a #30 drill bit (.129 - 0.133 diameter).

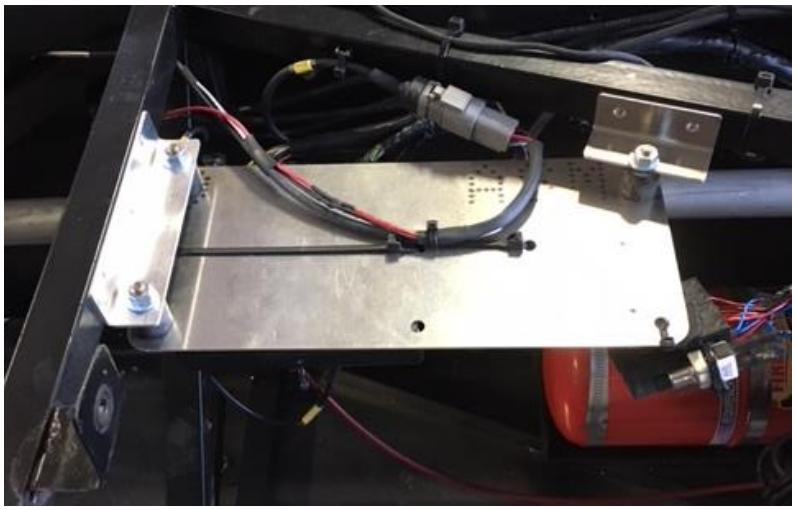


Figure 35 – ECU, Relay, and Wide Band Mounting (Top View)

Passenger Side Harness Installation - Power

+ Battery to Master Power Cable

The long red positive cable runs from the battery to the master switch hot side as it did in the GEN2.

- Battery to Ground Cable

One of the short black cables runs from the battery to ground lug just close to the battery. Do not connect this cable to the battery until just before starting the car.

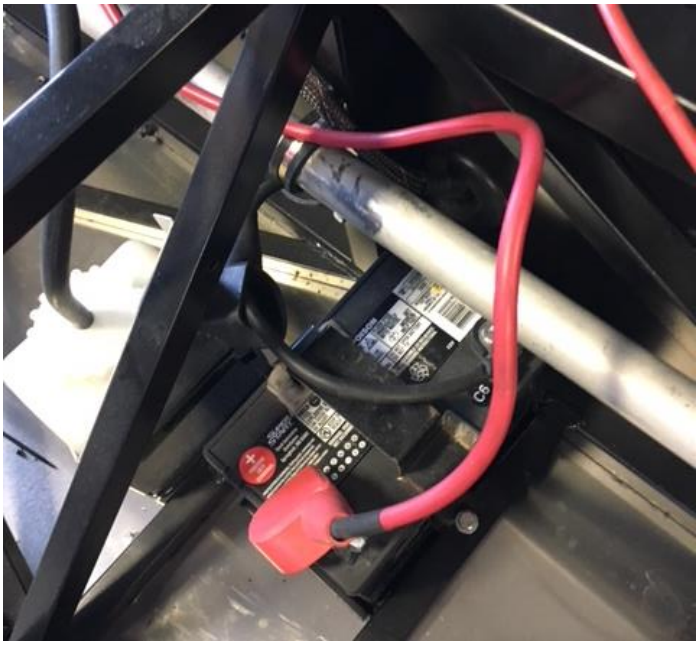


Figure 36 – Battery Cable Installation

- Transaxle to Ground Cable

The other short black cables runs from the transaxle to ground lug above the transaxle. Attach the cable to the frame and leave it hanging until the motor is installed.

Passenger Side Harness Installation – Chassis Harness

Route the chassis harness along the passenger side upper 1.5” square tube where the Ty-Wrap tabs have been installed. Use tie-wraps to attach the chassis harness and red battery to master switch cable. Make the connections at both ends of the harness.

Oil Cooler Harness Installation

Install the oil cooler harness. Use tie-wraps to attach the oil cooler harness to the frame.

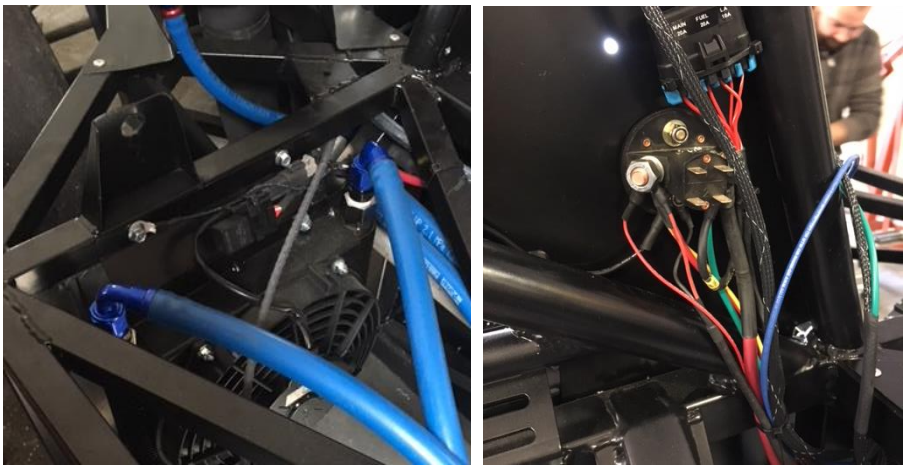


Figure 37 – Oil Cooler Harness (Pod & Engine View)

Engine Compartment Harness Installation

1. Place two Tie-Wrap Tabs on the diagonal tubes about 3” below the cross-frame rail. (See Figure 38) Drill holes with a #30 bit and then pop rivet them in place using 1/8” aluminum rivets (Part# 1001835). Rout the ECU harness to the Master Power switch and tie-wrap them to the frame.

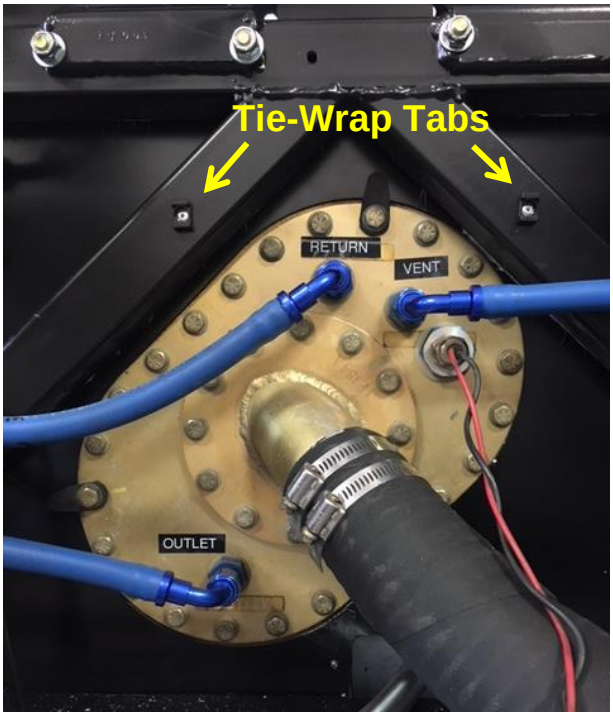


Figure 38 – EFI Harness Tabs Engine Bay

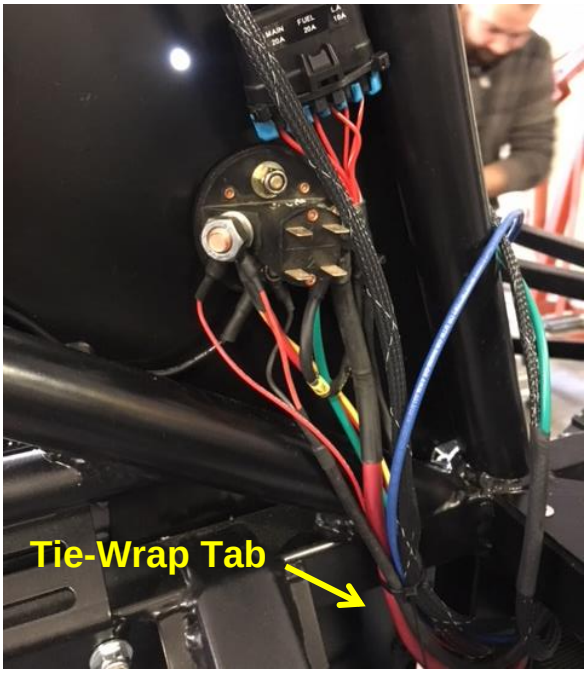


Figure 39 – Engine Bay - Master Switch

2. Attach all the wires to the master switch. Wires come from the chassis harness, oil cooler fan harness, the ECU harness, and the transponder harness. The attach a tie-wrap tab about 2” from the side rail as show and tie-wrap the wires going to the master switch.

O2 Sensor Wiring

3. Place three Tie-Wrap tabs under the upper rear 1.5 X 1.5” frame rail. (See Figure 40) These are to hold the O2 harness that will be installed later in the assembly process. Drill holes with a #30 bit and pop rivet them in place using 1/8” aluminum rivets (Part# 1001835).

Figure 40 – Tie-wrap tabs for O2 sensor

Completed By: _____ Date: _____

6. Engine Installation

6.1. Engine Overview

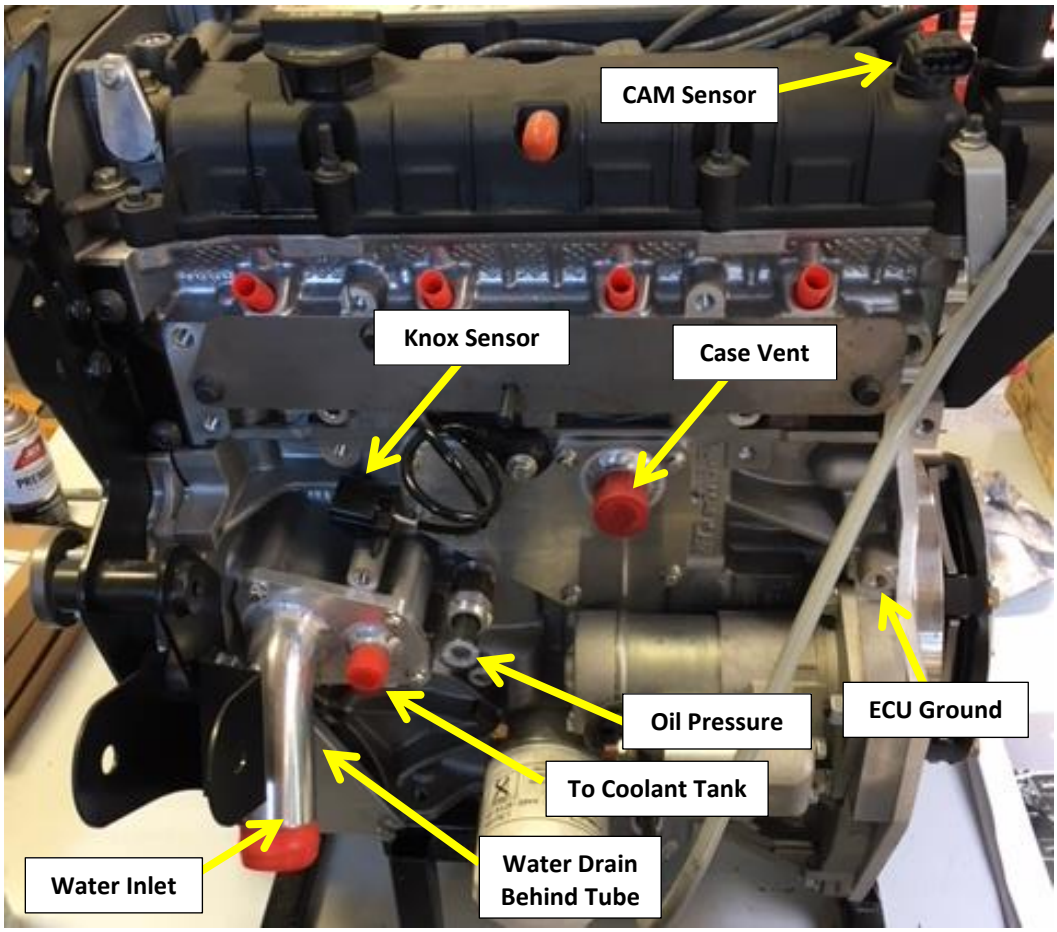


Figure 41 – Rear View of Engine

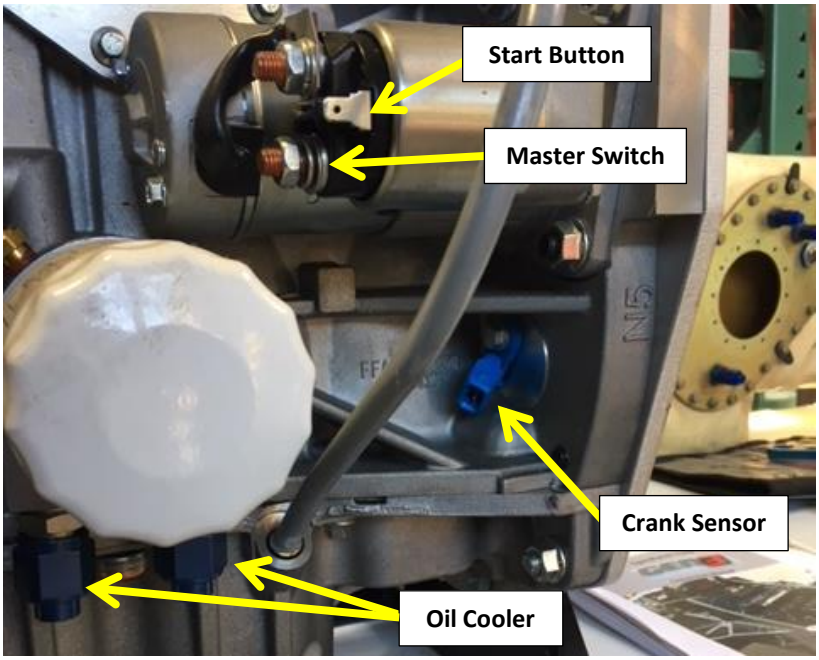


Figure 42 – Rear Lower Right View of Engine

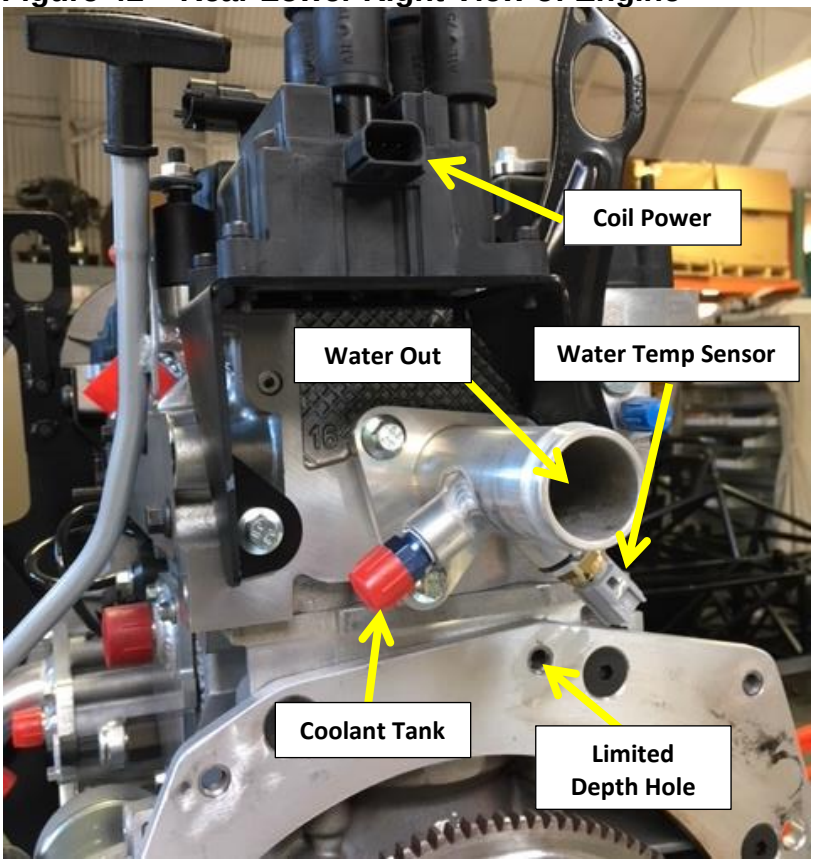


Figure 43 – Rear Lower Right View of Engine

6.2. Engine Preparation

The engine comes with most of the accessories already installed. Some of the connections at the front of the motor are hard to connect after the motor is installed. It is recommended that the wire harness and some lines are attached prior to the installation. It is also recommended that the intake manifold and throttle body be attached to the engine before installation. It is recommended that the transaxle is not installed with the engine.

Engine Wire Harness

1. Install the wire harness to the engine. The connections are labeled on the harness for reference. Tie-wrap the harness in place to be sure there is no strain or pulling on the connections to the sensors.
2. Install the 33" water hose from the thermostat plate that will go to the water fill tank.

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
33"	-8 90° to Hose	-8 on thermostat plate	-8 to Hose	Lower fill tank fitting

3. Install the 19" vent hose from the center of the engine block that will go to the water fill tank.

Length	1st Fitting	1st Connection	2nd Fitting	2nd Connection
19"	-12 30° to Hose	Engine block vent	-12 30° to Hose	Oil breather tank

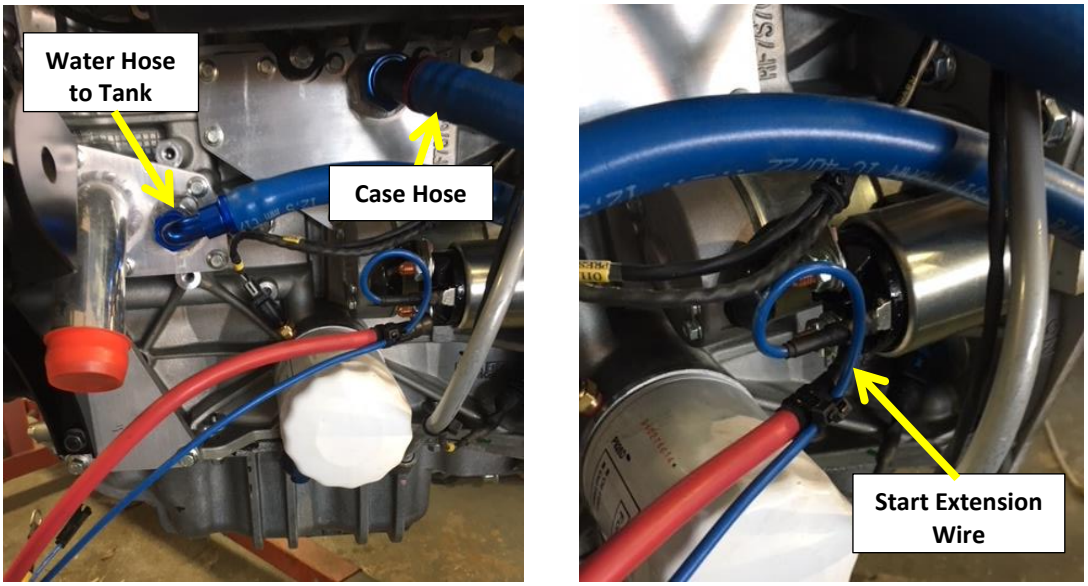


Figure 44 – Engine Preparation and Starter Connections

4. Install the starter power wire to the starter solenoid. It is recommended that a jumper wire is fabricated to attach to the starter solenoid spade tab. It is hard to reach this and a jumper allows the removal of the starter or engine without removing this connection.

Throttle Body Installation

Install the throttle body assembly and throttle cable bracket onto the intake manifold.

6.3. Engine Installation

It is recommended that the transaxle is installed first and then the engine.

1. Place the transaxle in the frame and move it to the far left. Using a rope or ratchet strap can help keep the transaxle in the far-left position.
2. Lower the motor into the chassis until it lines up with the transaxle.
3. Mate the transaxle to the engine by hand, do not force the process. If the transaxle doesn't want to mate, try rotating transaxle a little to get the splines to align.
4. After the transaxle is mated to the engine start bolting the two together. **IMPORTANT,** the transaxle bolt in the 12:30 to 1 o'clock position must not be longer that 45 mm (Part # G1010010). That bolt location in the adapter plate is against the engine block - **using a bolt longer than 45 mm will crack the block or adapter plate**.

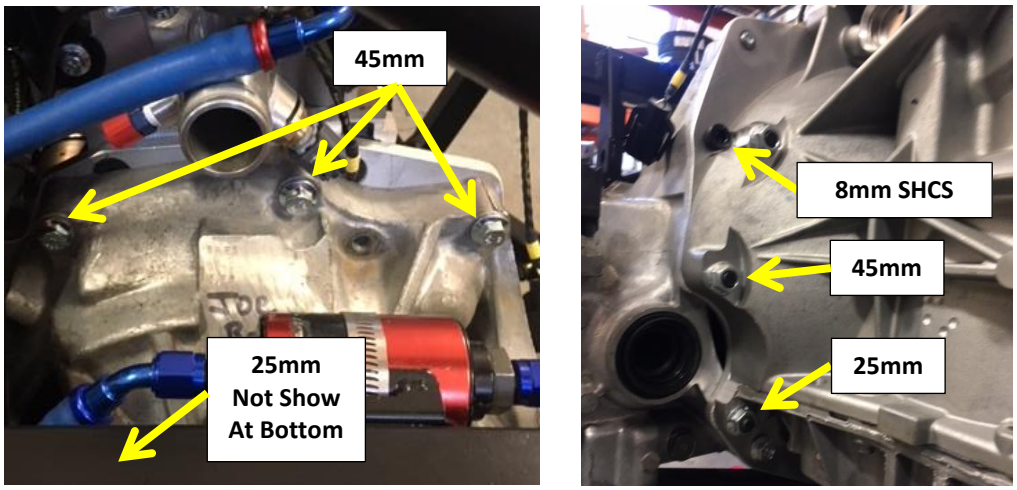


Figure 45 – Engine to Transaxle Bolts

5. Transaxle Brackets - Install the upper transaxle bracket with 3 bolts, wait until later to tighten them. Install the lower rear transaxle bracket to the transaxle.
6. Engine Mounts - Install the 3 engine and transaxle mounting bolts without tightening them.

Figure 46 – Tightening the Right Engine Mount Bolts

7. Install the upper head engine bracket (Part # G1139301) with 2 head bracket bolts using the 13mm flex socket (Part # 2X G1010055 & G800013). Install the 12mm head bracket mount bolt and after all 4 are all in, tighten the mounting bolts and 3 upper transaxle bolts. All the hardware should be tightened after all bolts are in place.

Note: If you are having trouble with your mounts lining up we have produced a couple of new parts to help with that problem. Left lower transaxle mount with ½" of horizontal adjustment and a shorter upper trans mount to help rotate up away from the lower 1x1 frame tubes. (Transaxle mount "Lower" Part # 1139101A, Upper Part # 1139201, Base Shim Part # 391201B)

Shift Shaft Connection

A longer rear fish mouth adapter and hardware must be used to attach the shifter to the transaxle. These are needed for the shift shaft to clear the oil pan and installed later in this manual.

1. Locate the following parts and hardware.

Part #	Description	Quantity
G393474A	FISHMOUTH ADP FOR BENT SHAFT	1
1090031	BOLT, HEX M12-1.75 X 90	1
1001105	NUT, NYLOCK M12-1.75	1

Attach the shift shaft to the transaxle using the new longer fish mouth adaptor with the above hardware. It is a good practice to safety wire the spring pin to the universal.

Figure 47 – Rear Transaxle Shift Linkage

Starter Power Cable

Attach the starter power cable to the switched side of the master power switch. Attach the starter solenoid connection.

Throttle Body Installation

1. Install the throttle body assembly and throttle cable bracket onto the intake manifold.
2. Route the throttle cable and attach it to the cable bracket. Do a test fit and get the throttle cable free play in the ballpark, remove the bracket and tighten the cable jam nuts. You should never need to remove the cable from the bracket again.

Oil Cooler Line Hoses

Install the oil cooler lines from the engine to the oil cooler. Tie-wrap the lines as necessary.

Vent Hose

Attach the vent line at the back of the engine to the engine vent catch tank.

Clutch Assembly

Install the clutch hydraulic line to the fitting on the bell-housing. The pedal travel or clutch release point needs to be set. The car uses a pure racing type pressure plate and can be damaged by over stroking of the release bearing. It's important not to over depress the pressure plate.

1. Only press the clutch pedal about half way before the stop is set. Carefully bleed the clutch hydraulic system of all air.
2. While the car is in gear, slowly depress the clutch pedal while you try and roll the car. Set the pedal stop about 1/8“ to 3/16” past where the clutch releases (car just starts to roll)

Note: The action of the clutch is very quick to grab and much less forgiving in action than the OEM unit we use in the 1.9 L. Be very careful with the clutch action your first couple uses.

Vacuum Line Connections

Part #	Description	Quantity
G1010040		

The 16” piece of hose vacuum hose on the intake manifold near the throttle body connects to the vacuum port on the Fuel PSI Regulator (Vacuum Hose Part #G1010040) This is required for proper air / fuel ratio. See Figure 48

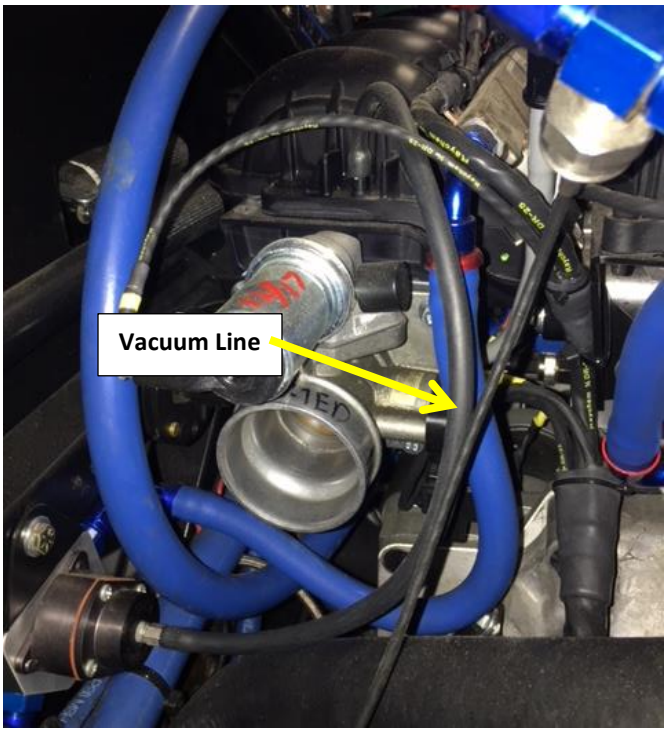


Figure 48 – Vacuum Line Connection

Radiator Hoses

Install the right-side radiator hose (Part # G691802) from the coolant tube to the back-right side engine water fitting. Install the new left-side radiator hose (Part # G691801) from the coolant tube to the left side engine water fitting.

Alternator Installation

The GEN3 uses the new Bosch alternator from the 1.9 L engine (Part # 902127).

1. Install the new four-groove pulley on to the alternator. (Part #G902130)
2. Install the alternator with the new pulley in the car using the existing bottom bolt and the supplied top bolt and washer. (Part # G1010005 & G1000256) Do not tighten at this point.
3. Place the alternator on the bottom bracket and feed the bottom bolt in from the left. (It will pass under the intake manifold)
4. Route the belt as shown in Figure 49. Start with the belt on the new alternator pulley and

the lower crank pulley outer groves. With the alternator loose, slide the belt over the water pump pulley. (This belt is tight and you may have to remove the upper bolt to get clearance.)

5. The two halves of the belt are very close to each other where the belt wraps around the water pump pulley ½ to ¾ of an inch. The belt doesn't need to be super tight and as the engines warms it will tend to tighten the belt. However, unlike the 1.9 L engine the belt also drives the water pump. IF YOU LOSE THE ALTERNATOR BELT ENGINE DAMAGE WILL OCCUR! It will be a matter of seconds before over heating occurs if the water pump stops turning. Make sure you set you data system or warning lights to alert you if your battery voltage drops below the running voltage. (Typ an alarm ≤ 13 volts will work)

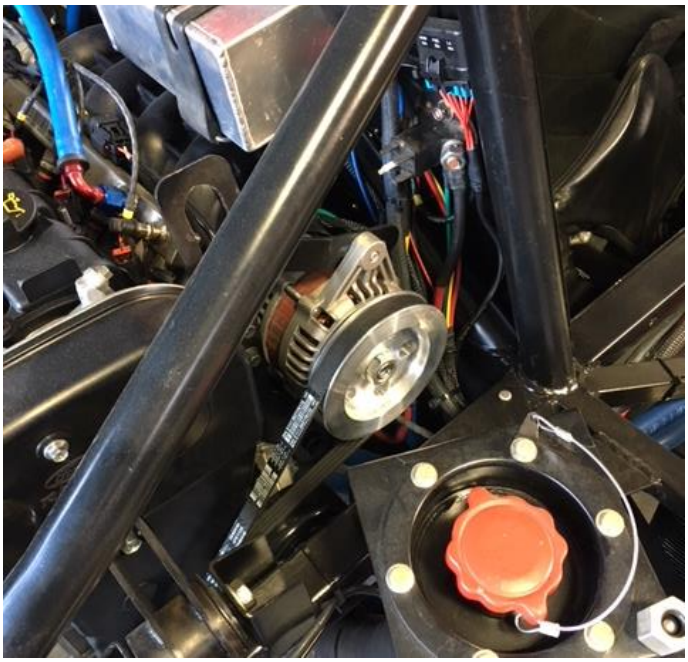


Figure 49 – Alternator Belt Routing

Expansion Tank and Water Line Installation

6. Attach the expansion tank mounting bracket to the firewall. Mount and secure the tank with the big rubber band or a long tie-wrap.
7. Connect the water line from the "T" to the expansion tank.

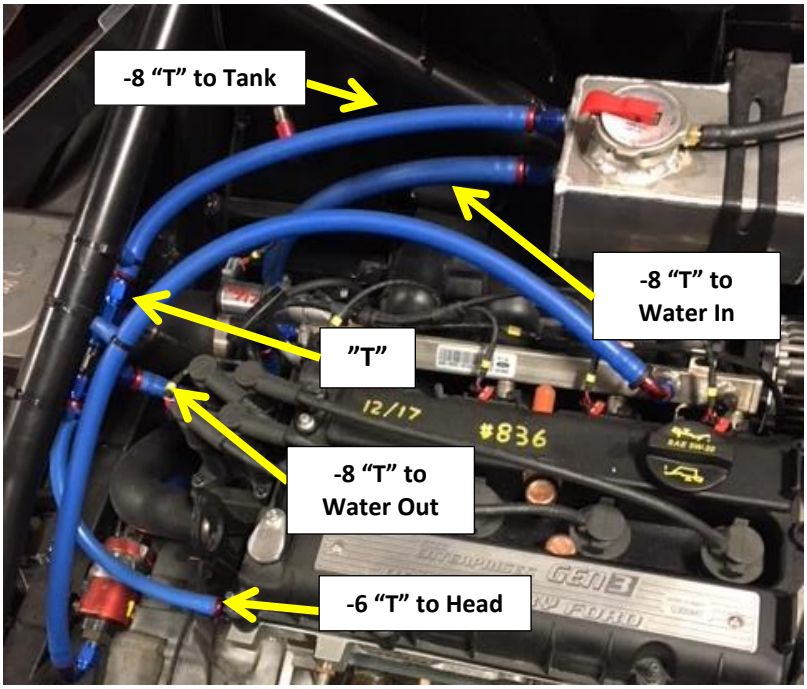


Figure 50 –Water Lines Connections

Axle Installation

Install the axles into the transaxle and spindles. Tighten the axle nuts to 150 ft-lbs.

Header / Muffler

Part #	Description	Quantity
G1010017	NUT, FLANGE HD M8-1.5	5
G1010060	CLAMP, MUFFLER LARGE	1
G1010061	CLAMP, MUFFLER SMALL	1
G1190503A	WIDEBAND KIT W/CONNECTOR	1
G301042	EXHAUST GASKET	1
G390520A	ADAPTER, HEADDER TO MUFFLER	1
G390522	STINGER, MUFFLER	1
G390523	GEN3 STANDARD MUFFLER	1
G390524	GEN3 QUIET MUFFLER ONLY (Laguna)	1
G391600	G3 HEADER ONLY	1
G391605	G3 TAILPIPE	1
G391606	G3 EXHAUST SPRING	2

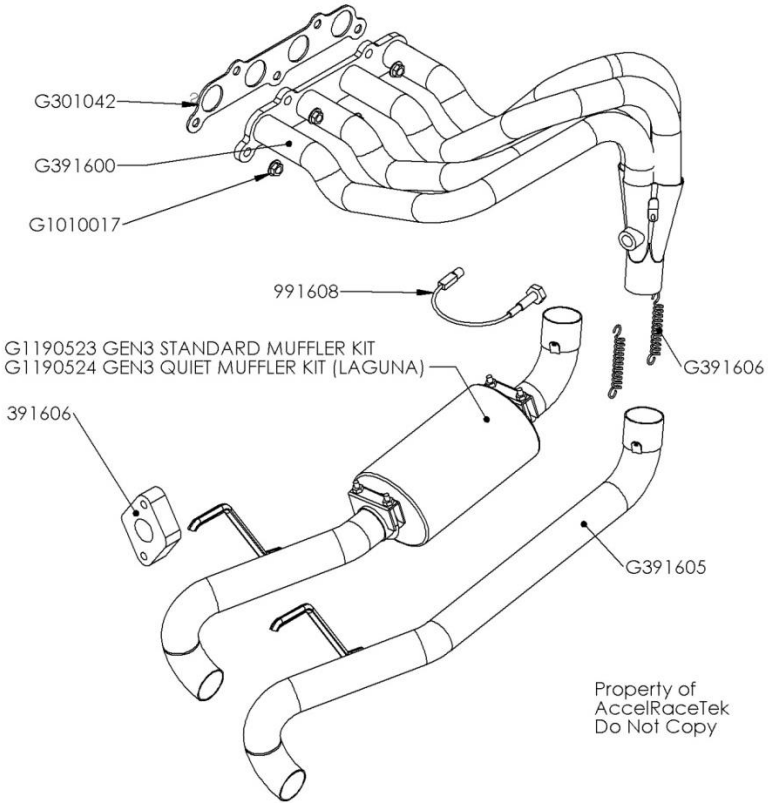


Figure 51 – Exhaust Exploded View

1. Install the header using the supplied gasket (gasket comes on the motor under the protective plate). Tighten the nuts to 16 ft-lb. Use the rubber hanger from the 1.9 engine and stud on the frame the same as before.
2. It is recommended to safety wire the springs to the header to prevent them from coming loose. Vibration can cause it to detach.

Figure 52 – Muffler and Header Installation

Transaxle Ground Cable Installation

Attach the transaxle ground cable will run from the transaxle to the rear frame ground location (the rear welded stud). Use the existing bolt, a new bolt is not supplied with the kit.

Engine ECU Wire Harness Connections

1. Connect the engine wire harness to the ECU connector. Tie-wrap the harness as necessary.
2. Connect the O2 sensor to the ECU harness.
3. Connect the speed wires from the engine harness to the speed sensor on the transaxle.

Wheels

Install the rear wheels and torque them. Lower the car off the jack stands.

Intake Air Box

1. The GEN3 will use a new air box (See Figure 53) that will mount to the frame behind the left side center section resting on the 1”x”1” tubes.
2. Fit the intake tube to the throttle body and the onto the center section air inlet. With the air filter out, mark the mounting locations on the 1” x 1” tubes.
3. Remove the air box, drill the marked locations, the proper size for either ¼” Nutsurt or Well nuts. If you use Well nuts be sure and deburr the hole. Note: Well nuts are flexible to help protect the air box in mild impacts.
4. Install the air box, filter, and lid. (See Fig 40) The gap between the air box and the center bodywork, is not designed to be and should not be sealed by any means.

Figure 53 – Air Box Installed

Battery Connection

Connect the ground and hot side of the battery.

6.4. TPS Sensor Calibration

The proper calibration of the TPS sensor has the biggest effect is on throttle tip in, just off idle and starting performance. There is almost no effect on full throttle as the upper 10% of the map is nearly all the same settings. TPS calibration is needed for each TPS sensor. Once you have completed it, it will not need to be done again, unless you change sensor or install a different throttle body with a different sensor.

This TPS calibration, plus the fault codes and couple of other things in the software are not be password protected. All other parameters of the ECU will be password protected. *Modifying any of the spec tuning by any means, passive or active, will be considered a drivetrain violation*.

Check SCCA Enterprises web site for current PE Monitor V.XX ECU software

You will need the Performance Electronics (PE) tuning software installed on a Windows PC with an Ethernet port (RJ45 port). Plug the communication cable (Part # G992014) into the laptop and the other into the USB-B socket in the ECU wiring harness and follow the instructions below:

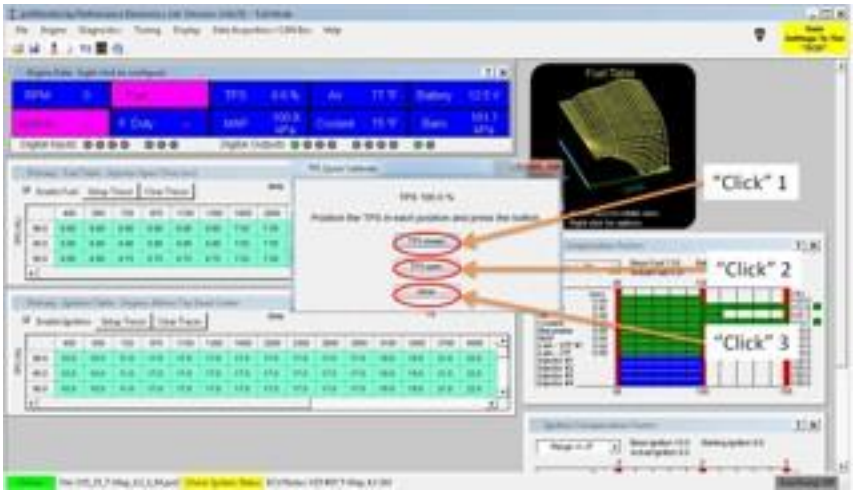
1. Turn on the “MASTER” and “IGNITITION” switches
2. Open PE3 Monitor software (Icon or version may vary)

3. The software should open with an option to “FIND ECU”. If the software did not open with this question or you closed the window: Select “Engine” from the top drop-down menus and click “FIND ECU"
4. Select “DIRECT” it will tell you if the ECU is found or not. “CLICK OK“

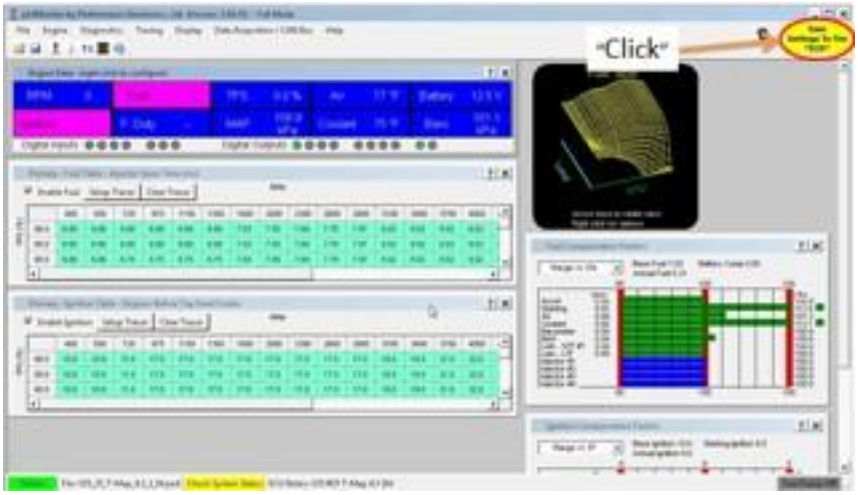
5. If a network connection is not seen wait 30 or 45 seconds and try again.
6. Sometimes you may need to cycle the “IGN Switch” and try again. You may need to give the PC a minute or so to complete the handshake with the ECU, your PC sees the ECU as a “NETWORK”. Some may take longer than others to complete the handshake. (Most of the time this connection is made within seconds)
7. Select “Engine” from the top row drop down tabs

8. Select “TPS Quick Calibrate

9. Click the “TPS closed”
10. Hold the throttle in the fully open position, then Click “TPS OPEN”
11. Click “DONE. If you don’t feel you did this right or had the throttle in the correct position; repeat the steps.
12. The box in the upper right-hand corner will change to indicate “changes not saved to ECU” (Yellow Background)



13. Click “SAVE DATA TO ECU” in the upper right-hand corner of the software view page. This uploads the changes to the ECU. It does not save the file to your laptop



14. Then last “CLICK OK” on the Data saved window.

Notes on ECU connectivity:

If you get an error message such as “ECU Found! Incorrect Version” you will need to contact your local CSR or Enterprises to have the firmware on the ECU updated to the latest. This can be done from your PC but will require additional support.

6.5. Data Logger Configuration

Generic Configuration

Water Pump Alarm

The GEN3 drives the water pump off of the alternator belt so make sure the water temp and battery voltage include alarms or lights that will alert you when either of these becomes out of range. Recommend battery alarm below 12.7 volts. (13 will cause an alarm at idle but not on during run) This will alarm when belt comes off before water becomes hot.

Tachometer Redlines

Connect and check the engine tachometer. Set the redline in the data logger at 6,300 RPM

Engine Sensors

Connect and check all engine sensors, oil pressure, oil temperature, and water temperature at a minimum. Test the function of these sensors as best as possible prior to starting the engine. The temperatures should read close to room temperature.

7. Starting Engine

7.1. Pre-Start Procedures

Fuel Pressure

1. Set fuel pressure to 45 PSI (all tuning was performed with this static pressure)
2. With pump running and engine off (use the momentary fuel pump switch)
3. Verify pressure with mechanical gauge on the fuel rail and verify your data system versus the mechanical gauge.
4. Remember that it may take time to prime the system with fuel.

Fill Water

Fill the cooling system with water and check level. This fills slower than the 1.9 L so take your time and make sure this is full. After starting it, let the engine idle with the cap off and continue to add as necessary. Consider using a vacuum pump to remove all of the air trapped in the system.

Fill Engine Oil

Fill the engine with oil. The engine uses a full length and width baffle between the oil sump and the crankshaft. We recommend running the oil level to the full mark to help minimize oil starving in very abrupt G loads. We’ve seen no adverse side effects to the higher level.

Fill Transaxle Oil

Fill the transaxle with oil.

7.2. Pre-Start Checklist

1. Check the alternator belt routing and tension. IF YOU LOSE THE ALTERNATOR BELT ENGINE DAMAGE WILL OCCUR! It will be a matter of seconds before over heating occurs if the water pump stops turning.
2. Double check all oil, fuel, and water fittings to be sure they are tight.
3. Verify the engine oil level.
4. Verify the transaxle oil level.
5. Make sure all four ground connections are tight.
6. Pressure check the cooling system if a pressure check tool is available.

7.3. Initial Engine Startup

Oil Pressure Check

Turn on the master power but leave off the ignition. Crank the motor until you see some oil pressure. It is a good idea to have a computer connected to the car at this time. All of the key parameters of the engine can be monitored with the computer, like oil pressure, water temperature, etc.

Engine Start

Turn on the master power and the ignition and attempt to start the engine. The engine should start in a less than 10 seconds. If not shut down the power and recheck all connections.

Initial Engine Startup

1. Water level should be checked continuously during warm up. It is a little more difficult to bleed all the air out of this cooling system in the GEN3. To help this process, jack up the left side of the car with the engine running to bleed the air from the coolant system. This is critical, make sure you watch the level during this process and add water as needed. Repeat this until the water level remains constant.
2. After the engine starts it is important to run the engine at idle until it gets to temperature. The initial startup of your car will cause the ECU to calibrate the Idle Air Control (IAC) and TPS for your hardware. After the water temp reaches 170° leave the throttle at idle until the temperature passes180°. (i.e. don't stand there and rev the motor up and down over this temperature range) The ECU will run the calibration "learning" process over this temperature range. After the ECU runs the calibration process and goes over 180° the engine can be shut down.
3. When engine is not running, turn off the master power switch. Keep the Master in the OFF position ANYTIME the car is not going to be started for more than a few minutes. It will drain the battery in a very short period! The new ECU has a higher nominal current

draw versus the 1.9 L version.

Post Start Check

After the car is started for the first time it is recommended that the following procedure is followed.

1. Check the alternator belt routing and tension.
2. Double check all oil, fuel, and water fittings to be sure they are tight and you see no leaks.
3. Verify the engine oil level. Check for oil loss.
4. After the car cools, check the water level. Check for water loss.
5. Nut and bolt the car. Go over all of the nuts and bolts to check to be sure they are tight.

7.4. First Time Out

After the car has been started and run at the shop it is time to get the car on the track for testing.

1. Warm Up the Car – Start the car and while the car is warming to operating temperature continue to check all key engine parameters like oil pressure and water temperature.
2. Pre-Track Check – After the initial warmup shut down the car. Check the oil level. Do a visual check of the complete car looking for any leaking fluids.
3. First Lap – If the car checks out take it for one lap at a reasonable pace. Check the key engine parameters as much as possible. If something looks out of the ordinary shut down the car immediately. After the first lap go back to the pits and check over the car.
4. First Session – If the car looks good after the first lap take the car out for about a 15-minute session at a reasonable pace. Check the key engine parameters as much as possible.
5. Cool and Check - Allow the car to cool and go through a complete check of the car. If the car checks out you are now ready to run the car.

7.5. First Service

After the car has run from 10 to 30 hours complete the following procedure.

1. Leak-Down Testing – Test the leak-down of the cylinders and after the leak-down numbers become constant change the oil. This should be anywhere from 10 to 30 hours.
2. Engine Oil & Filter Change – Change out the engine oil from non-synthetic to synthetic with the appropriate viscosity. The oil should be changed no later than after 30 hour of operation.
3. Transaxle Oil Change – Change out the transaxle oil from at the same time the engine oil is changed.

8. Appendix A - GEN3 Specifications

8.1. Engine Specifications

Year	2004-present day
Fuel system	Electronic fuel injection
Valves per cylinder	4
Bore X Stroke mm	79.0 X 81.4
Compression Ratio	11 to 1
Displacement, cc	1596
Clutch disc minimum thickness	.270”
Flywheel size	Must maintain .100” step
Flywheel size weight	Minimum weight 7 lb 3 oz
Power, hp at peak rpm	115 / 6000
Power peak rpm	6,100 to 6,300 rpm
Torque, lb-ft	114/4150
Torque peak rpm	4,000 to 5,100 rpm
Rev limit	6,750
Engine weight	90 kg, 198 lb
Engine oil viscosity	
(Air temp <55°F or oil temp <200°F)	0W-20 or 5W-20 synthetic
(Air temp 55- 90°F or oil temp 200-250°F)	0W-30 or 5W-30 synthetic
(Air temp +90°F or oil temp +250°F)	10W-30 or 10W-40 synthetic
Engine oil capacity, liter	4.1
Fuel octane rating	92 minimum
Spark plug gap	.035” - .038”
Spark plug brand & part number	LTR7IX-11 Iridium
Coolant temp	180° to 195° F
Oil temp	215° to 240°F

8.2. Torque Specifications

Thread size	Location	Torque (ft lbs)
6mm	Generic Specs for Aluminum Hole	5
8mm	Generic Specs for Aluminum Hole	16
10mm	Generic Specs for Aluminum Hole	35
	Bell Housing to Engine	35
	Clutch Pressure Plate	16
	Engine Ground Wire Bolt	7
	Engine Mount Bolts	35
	Exhaust Header Nuts	12
	Flywheel Bolts	65
	Fuel Rail Bolts	8
	Ignition Coil Screws	5
	Intake Manifold Nut	13
	Oil Pan Drain Plug	21
	Positive Battery Cable	7
	Pressure Plate Bolts	16
	Spark Plugs	11
	Starter Motor Bolts	35
	Timing Belt Tensioner	18

9. Appendix B – Key Service Procedures

9.1. Pumping Out the Fuel Cell

To pump out the cell simply remove a fuel line from filter inlet, place it in the fuel jug, and hold the button down. The new switch is tie-wrapped with the relays in a similar manner as the 1.9 L. This function can be used to purge the fuel system or to work on the fuel system.

9.2. Calibration of a Replacement O2 Sensor

The first O^2 sensor supplied with the kit has been pre-calibrated at SCCA Enterprises. If an O^2 sensor replacement is required, a free air calibration of this sensor is required. This should be done when the sensor is in new condition. To calibrate a new O^2 sensor complete the following procedure.

1. With the sensor in clean fresh air out of the exhaust hanging off the back of the car.
2. Turn your master switch on to heat the sensor for about 1 to 2 minutes on 75° day (longer if it's cooler).
3. Check the status light on the controller. It should be flashing fast. If not, turn the adjusting screw counter clockwise very gently until it stops.
4. Pause for a few seconds and start to turn the screw very slow and gently clockwise until the light just starts to flash fast. This is the set point. This is very important as the ECU uses the O2 signal in closed loop to adjust the air / fuel ratio. Note: not a blanket fix at all. It has a limited +/- window of Fuel adjustment.
5. You should only attempt a free air adjustment when sensors are in new condition or very low hours of use, less than 8 to 10 hours or 2 events or less. If it is grossly fouled, low quality or leaded fuel is used MAJOR ENGINE DAMAGE CAN OCCUR. It is good idea to keep a spare sensor. It's not something you can buy from an auto parts store. It is a required Spec Part. (Part # G990504)

10. Appendix C – GEN3 Kit Parts List

Part #	Description	Remarks	Qty
580627	ROUND FUEL CELL GASKET		1
680800	-8 STRAIGHT FITTING	BOTTOM LEFT COOLANT TANK	1
691903	-6 90 DEGREE FITTING PUSH ON	FUEL, WATER LINES	5
691921	-6 45 DEGREE FITTING PUSH ON	FUEL, WATER LINES	4
691928	-6 STRAIGHT FEMALE P/O ALUM	WATER LINES	4
692410	-8 90 DEGREE FITTING PUSH ON	WATER RETURN HOSE, OIL COOLER LINES	3
902127	ALTERNATOR	REQUIRED FOR 1.6 IF NOT PREVIOUSLY INSTALLED	1
992006	FOAM	FUEL FILTER BRKT	1
1000100	BOLT, HEX 1/4-20 X .5	CATCH BOTTLE BRKT TO BOTTLE	2
1000106	BOLT, HEX 1/4-20 X .5	OIL COOLER (4) FUEL PRES BRKT TO FRAME (1)	5
1000255	WASHER, FLAT M8	BULK HEAD TO LINES (UNDER JAM NUT)	2
1000364	NUT, HEX 1/4-20	FOR ECU PLATE BOLTS	6
1000380	NUT, JAM 3/8-24	CLUTCH LINE	1
1001105	NUT, NYLOCK M12-1.75	SHIFTER BOLT	1
1001835	POP RIVET 1/8 X 3/16 ALUM	TYWRAP BLOCKS	48
1002000	POP RIVET 3/16 ALUM	COOLANT OVERFLOW BOTTLE BRKT	3
1002068	POP RIVET 1/8 X 3/8 STEEL	ECU BRKTS	6
1016244	WASHER, FLAT #10	FUEL FILTER BRKT (2) FAN (4) OIL COOLER (4)	10
1020380	WASHER, LOCK 1/4	CATCH BOTTLE BRKT	2
1020392	WASHER, FLAT 1/4	CATCH BOTTLE BRKT, ECU RUBBER MNT, FUEL REG MNT, OIL COOLER MNT	12
1080606	NUT, NYLOCK #10-32	FAN/COOLER	4
1090021	TAB, TYWRAP	FUEL FILTER BRKT (1) ECU TO PLATE (5)	6
1090031	BOLT, HEX M12-1.75 X 90	SHIFTER JOINT TO TRANS	1
1090099	POP RIVET 3/16 X 3/8 STEEL	CATCH BOTTLE BRKT	2
1150002	IN TANK FUEL PUMP KIT	REQUIRED FOR 1.6 IF NOT PREVIOUSLY INSTALLED	1
180512A	FIRE BOTTLE BRKT	OPTIONAL (CAN BE MOVED TO RIGHT SIDE OF CAR)	1
698001A	-6 FUEL HOSE PER INCH	COOLANT LINES/ FUEL LINES	108
698002A	-8 OIL HOSE PER INCH	OIL/COOLANT LINES	108
902127A	ALTERNATOR PIGTAIL	REQUIRED FOR 1.6 IF NOT PREVIOUSLY INSTALLED	1
G1000256	WASHER, FLAT M8 LARGE OD	ALTERNATOR ADJUSTOR	1
G1010001	STUDDED RUBBER MOUNT	ECU PLATE TO ECU BRKTS.	3

Part #	Description	Remarks	Qty
G1010005	BOLT, FLANGE HD M8-1.0 X 16	CLUTCH LINE MTG. PLT. TO G/BOX (2)/ GROUND BUNGS (2) ALT. ADJ. BRKT.	5
G1010008	BOLT, FLANGE HD M10-1.0 X 25	ADAPTOR PLATE TO GEAR BOX UNDER OIL PAN	2
G1010010	BOLT, FLANGE HD M10-1.0 X 45	GEAR BOX TO ENGINE PLATE	4
G1010026	SCREW, BHS #10-24 X 1/4	FUEL PRES. REG. BLOCK TO BRKT.	2
G1010030	VELCRO LOOP PER INCH	ECU TO MTG. BRKT	12
G1010031	VELCRO HOOK PER INCH	ECU TO MTG. BRKT	12
G1010038	TYWRAP BLOCK		24
G1010041	3/8 HEATSHRINK PER INCH	FOR GROUND CABLES	8
G1010045	WASHER, #10 RUBBER	FAN/COOLER	8
G1010046	SCREW, PH #10-32 X .75		4
G1010047	NUTSERT, 1/4-20	OIL COOLER(3 IN FRAME), FAN (2 IN BRKT) FUEL PRES. REG BLOCK (1)	6
G1010048	NUTSERT, #10-32	FOR FUEL FILTER BRKT TO FRAME	2
G1010049	SCREW, BHS #10-32 X .50 SS	FUEL FILTER BRKT. TO FRAME	2
G1010050	BOLT, HEX 1/4-20 X 1.5	OIL COOLER SPACER	1
G1010055	BOLT, FLANGE HD M10-1.5 X 50	HEAD MOUNT TO HEAD	2
G112013	DATA CONNECTOR	OPTIONAL (EXTRA CHARGE)	1
G1139261A	HYD T/O BRG ASSY		1
G1139301	HEAD ENGINE MOUNT RH	WITH G1010055	1
G1151001	GAUGE KIT	OPTIONAL (EXTRA CHARGE)	1
G1190501	G3 CHASSIS HARNESS	OPTIONAL (EXTRA CHARGE)	1
G1190502	G3 BATTERY CABLE HARNESS	OPTIONAL (EXTRA CHARGE)	1
G1190503A	WIDEBAND KIT W/CONNECTOR		1
G1192127	G3 ALTERNATOR KIT W PIGTAIL	REQUIRED FOR 1.6 IF NOT PREVIOUSLY INSTALLED	1
G183001	WELD ON GROUND WIRE BUNG	WELD TO FRAME	2
G183002A	CATCH BOTTLE BRACKET #2	ATTACH TO FRAME	1
G391505	OIL BREATHER TANK W/FILTER	ATTACH TO CATCH BOTTLE BRKT.	1
G391600	G3 HEADER ONLY		1
G391605	G3 TAILPIPE		1
G392002	ECU MOUNTING PLATE		1
G392003	ECU BRKT 5"		1
G392004	ECU BRKT 2.5"		1
G392547	LINK -SHIFTER REAR - GEN3	OPTIONAL (EXTRA CHARGE)	1
G393474A	FISHMOUTH ADP FOR BENT SHAFT	FOR BENT SHIFT SHAFT - 1"	1
G462800	GEN3 HEADER TANK W/NECK	OPTIONAL (EXTRA CHARGE)	1
G462801	TUBE FOR G3 COOLANT TANK	(ONLY IF MODIFYING OWN TANK)	1
G480503	G3 OIL COOLER		1

Part #	Description	Remarks	Qty
G480504	OIL COOLER FAN		1
G480505	OIL COOLER FAN MOUNT		2
G480506	OIL COOLER FAN SPACER		1
G480507	OIL COOLER BRKT		1
G591904	FUEL REG ADAPTER	MOUNT TO ADAPTOR MOUNT	1
G591905	FUEL REG ADAPTER MOUNT	MTS FUEL PRES REG ADAP TO FRAME	1
G591912	FUEL FILTER BRACKET	LEFT SIDE OF ENGINE BAY	1
G591916	FUEL FILLER TUBE 2.25 X 36	OPTIONAL (EXTRA CHARGE)	1
G592230	AIRADE AIRBOX & TUBE		1
G592301	G3 THROTTLE CABLE	OPTIONAL (EXTRA CHARGE)	1
G602012	-3 90DEG TO -3 SS HOSE	CLUTCH LINE - END OF CHASSIS LINE (SHORTEN)	1
G691801	OUTLET HOSE LEFT SIDE		1
G691802	INLET HOSE RIGHT SIDE		1
G691803	-3 LINE FEMALE CLUTCH PLATE - TO BEARING		1
G691804	-3 LINE FEMALE WITH CLUTCH BLEEDER		1
G691925	-8 X 120 DEG PUSH ON	OIL LINE AT ENGINE	2
G691926	-4 HOSE PER INCH	COOLANT LINES	10
G691927	-4 FEM TO 1/4 HOSE PUSH ON	COOLANT LINE - HEAD TO TEE	2
G691929	-6 MALE AN PLUG	FRONT LOWER DRAIN HOSE	1
G691931	-6 AN MALE WELD ON ALUMINUM	(ONLY IF MODIFYING OWN TANK)	1
G691933	-12 AN CAP	BOTTOM OF COOLANT TANK (IF MODIFYING OWN TANK)	1
G691937	-6 MALE TO 9/16-18 O-RING	GO IN FUEL PRESS. REG. BLOCK	2
G691941	-6 120 DEGREE PUSH ON	FUEL LINES - END OF FUEL FILTER	1
G691943	-4-6-6 TEE	COOLANT LINES	1
G691945	-12 30 DEGREE PUSH ON	OIL BREATHER LINE TO CATCH BOTTLE	2
G730001	CLUTCH LINE MTG PLATE	HOLD CLUTCH LINES TO TRANS	1
G800010	10 MM GEAR WRENCH	TO INSTALL INTAKE FASTENERS	1
G800013	13 MM FLEX SOCKET	INSTALL HEAD MOUNT BOLTS - G1010055 TO G1139301	1
G902130	G3 ALTERNATOR PULLEY		1
G90500A	EFI HARNESS - PRS		1
G90501	G3 DASH HARNESS		1
G90502	G3 FAN HARNESS		1

Part #	Description	Remarks	Qty
G980476	DASH SWITCH	RAIN MAP/PIT SPEED	2
G980480	GREEN DASH LIGHT	DASH	1
G980480B	BLUE DASH LIGHT	DASH	1
G980495	OEM GM PSI SENSOR FUEL/OIL	GOES IN FUEL PRES. REG. BLOCK	1
G991412	ALT BELT FOR DRILLED PULLEY		1
G991818	GROUNDING LUG #6 X 5/16	GROUND CABLES (4)/STARTER CABLE (1)	5
G992012	PE3 SERIES ECU		1
G992013	SERIAL CONVERTER	OPTIONAL (EXTRA CHARGE)	1
G992014	DOWNLOAD CABLE 7'		1
WM1010117	WASHER, AN960-616 (3/8)	ALTERNATOR MOUNT (2) JET NUT (2)	1
WM1010174	SCREW, SHCS M5-.8 X 20	FUEL PRES REG TO ADAP BLK	3
WM1010185	SCREW, SHCS M10-1.5 X 35	ENG PLATE TO GEAR BOX	1
WM1010206	WASHER, HIGH COLLAR LOCK M10	USED WITH WM1010185	1
WM1010323A	-12 OIL HOSE PER INCH	OIL LINE BREATHER	19
WM1010376	-3 STRAIGHT BULKHEAD	CLUTCH LINE - CHASSIS CLUTCH LINE TO PLATE	1
WM802008	-3 TO -3 UNION	SLAVE SYL BODY	2
	SHIFTER LINKAGE DIAGRAM	SHIFTER	1
	DASH TEMPLATE DIAGRAM	DASH	1
	FORD RACING STICKERS	Mandatory Nose / Both sides of the Tail	3

11. Appendix D – Recommended Spares Parts List

The following are recommendations for spare parts. This list is not all-inclusive but a good place to start. Your local CSR will be able to provide these as well as other parts not on this list.

Part #	Description	Quantity
392499	Oil filter adaptor O-ring	1
G300999	Thermostat	1
G301022	Oil filter / Motorcraft FL910S	1
G301041	Spark Plugs	4
G980495	Oil PSI sending unit	1
G980495	Fuel PSI sending unit	1
G990504	O2 sensor	1
G991411	Alternator belt	1
G992701	Starter	1
WM301020	Air filter	1
WM901006	Ignition relay	1
WM901006	Fuel pump relay	1

12. Appendix E – Wire Harnesses

12.1. EFI Harness – Part # G90500A

EFI Harness – Engine Harness Connections

Connector	Pins	Connection
C1	39	EFI chassis harness
C2	3	Throttle position sensor
C3	1	Ground ring lug to engine ground
C4	3	Coil
C5	3	Oil pressure sensor
C6	2	Oil temperature sensor
C7	2	Speed sensor in transaxle
C8	2	Water temperature sensor
C9	4	TMAP sensor
C10	2	IAC
C11	3	Cam position sensor
C12	2	Knock sensor
C13	2	Fuel injector #4
C14	2	Fuel injector #3
C15	2	Fuel injector #2
C16	2	Fuel injector #1
C17	2	Crank position sensor

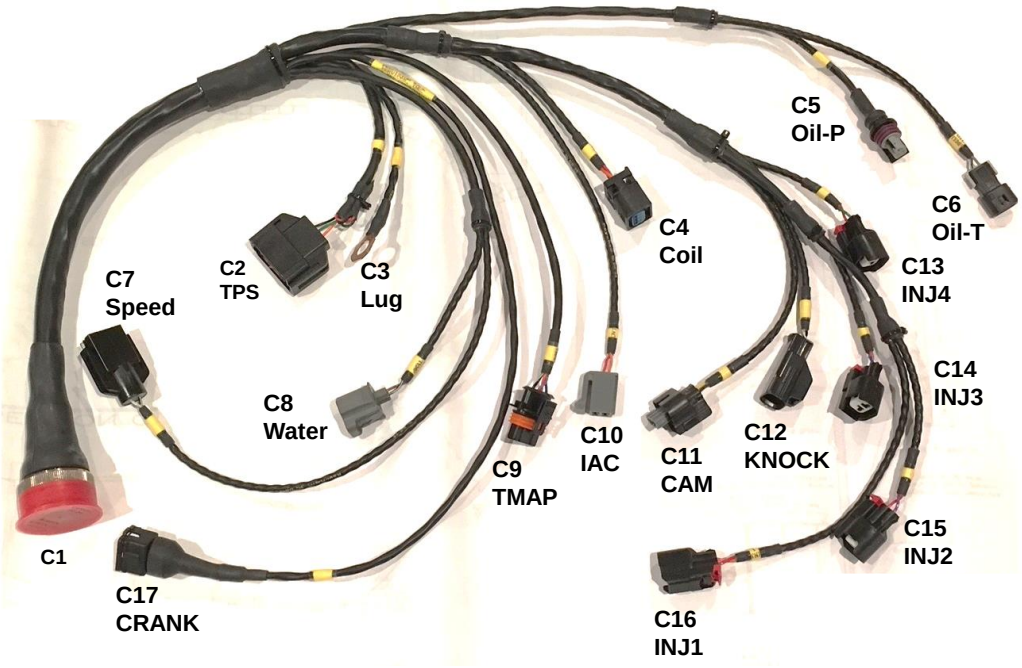


Figure A1 – EFI Harness - Engine Harness

EFI Harness – Front Section Connections

Connector	Pins	Connection
C1	N/A	Relay block – fuel pump button, fuel relay, main relay
C2	4	Data connector
Orange	1	CAN HIGH
Purple	2	CAN LOW
Red	3	12V Positive
Black	4	GND - 5 AMP MAX / Switched by the MASTER SWITCH
C3	N/A	ECU connector #1
C4	N/A	ECU connector #2
C5	2	ECU computer USB
C6	2	Connector splice
C7	6	Dash connection
C8	2	Spare
C9	4	O2 lambda sensor connector

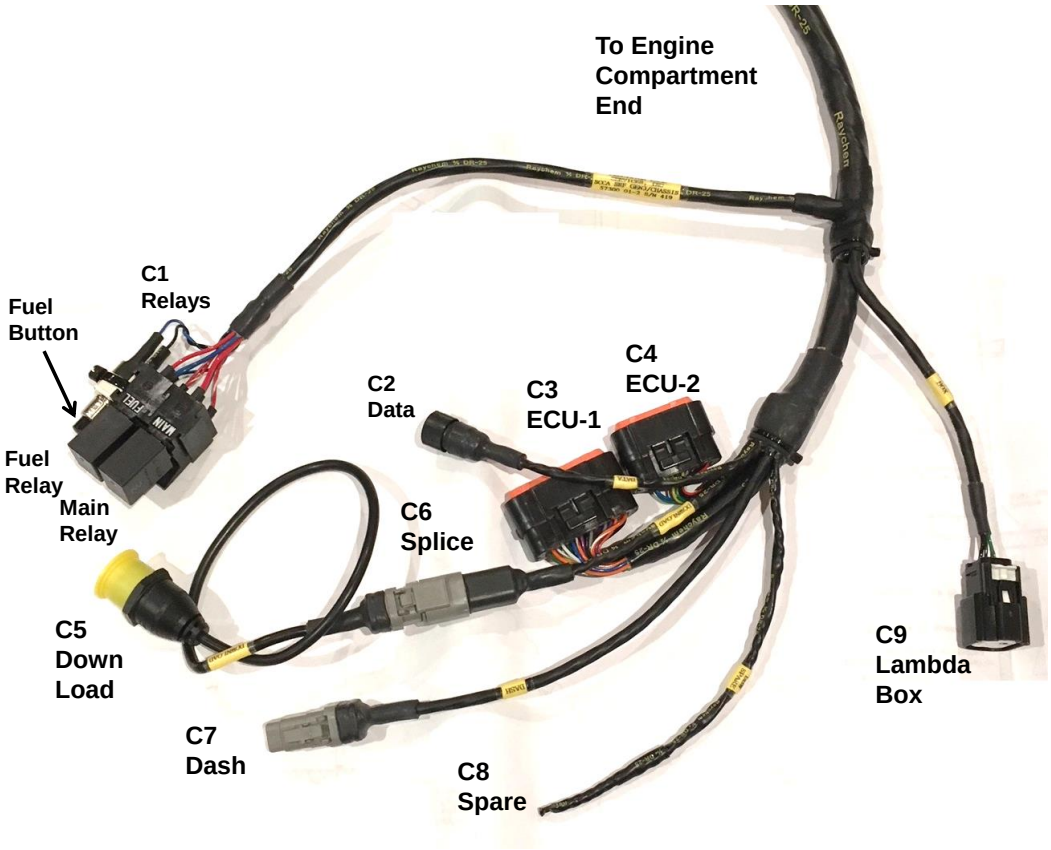


Figure A2 – EFI Harness - Front Section

EFI Harness – Rear Section Connections

Connector	Pins	Connection
C1	2	Fuel pump
Blue	1	Positive connection
Black	2	Negative connection
C2	2	Fuel pressure sensor
C3	N/A	Fuse block – Main 20A, Fuel 20A, & LA 10A
C4	3	3/8” Ring Lug to switched side of master power
C5	1	Oil cooler fan
C6	39	Engine wire harness

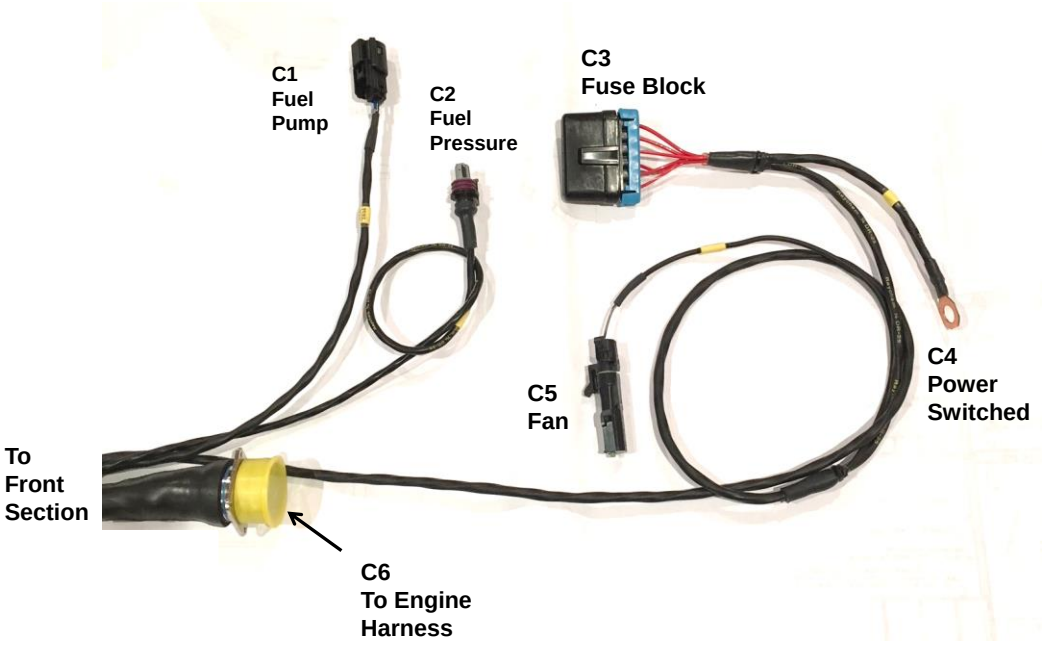


Figure A3 – EFI Harness - Rear Section

12.2. Dash Harness – Part # G90501

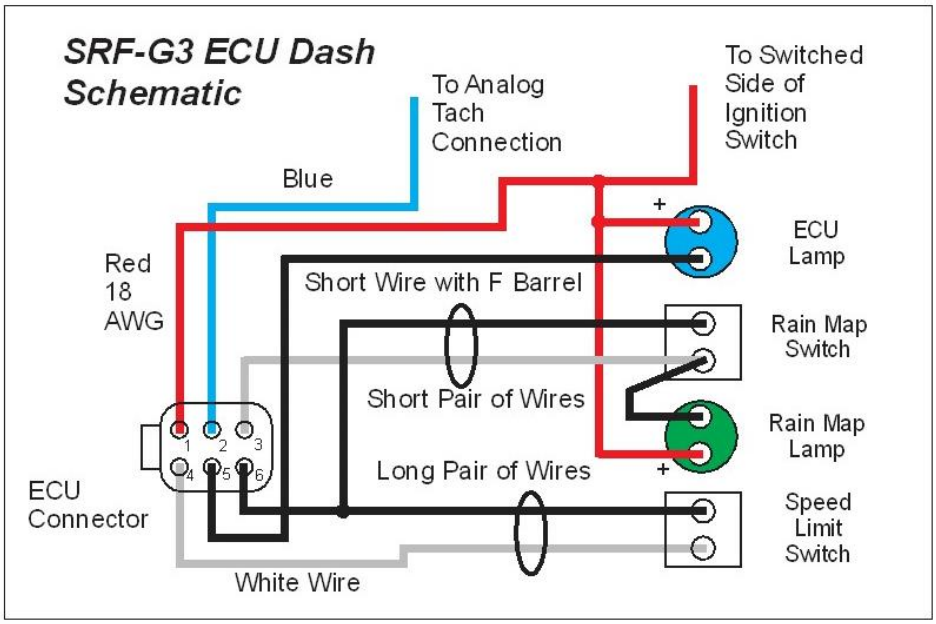


Figure A4 – G3 Dash Harness Schematic

Connections

Color	Size	Connector	Function	Other
Red	18	P1 Connector	Ignition yellow, ECU, and Rain Lamp	#8 Ring Lug
Blue	18	P2 Connector	To tachometer input	Bare wire
White	18	P3 Connector	Rain map switch	#8 Ring Lug
White	18	P4 Connector	Speed limit switch	#8 Ring Lug
Black	18	P5 Connector	Rain map switch and & ECU lamp	#8 Ring & FB
Black	18	P6 Connector	Speed limit switch	#8 Ring Lug

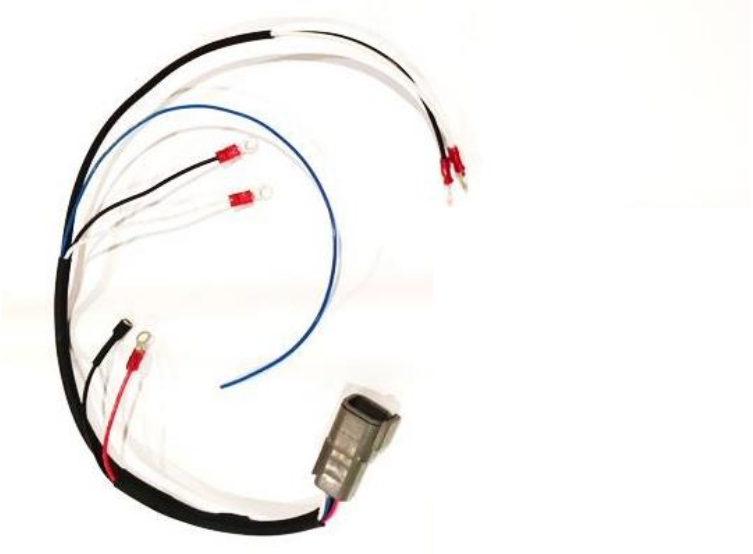


Figure A5 – G3 Dash Harness

12.3. Fan Harness – Part # G90502

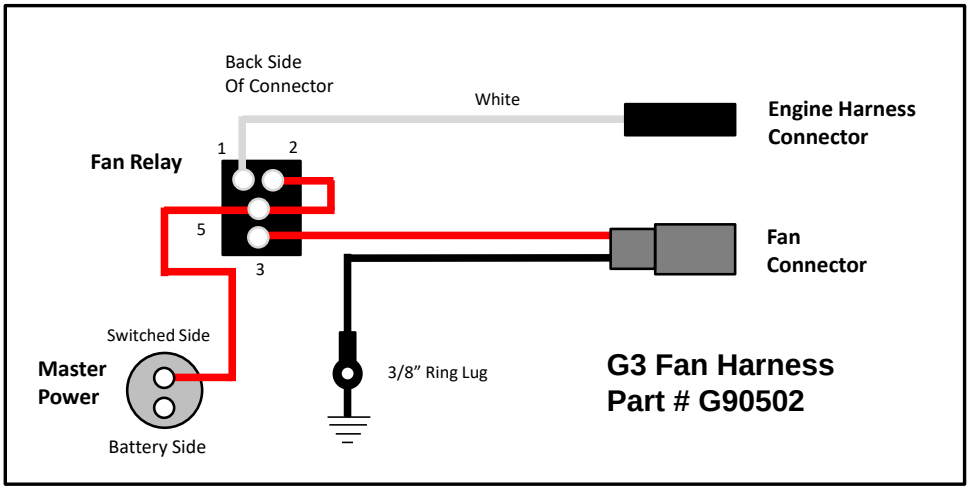


Figure A6 – G3 Fan Harness Schematic

Connections

Color	Size	Connector	Function	Other
Red	18	3/8" Ring Lug	From master power switch to fan relay	
Black	18	3/8" Ring Lug	From frame ground to fan connector	P2 Connector
Red	18	P1 Connector 1	From fan to relay	
Black	18	P2 Connector 1	From fan to frame ground	3/8" Ring Lug
White	18	P2 Connector 2	From engine harness to relay	

Figure A7 – G3 Fan Harness

12.4. Chassis Harness – Part # G1190501

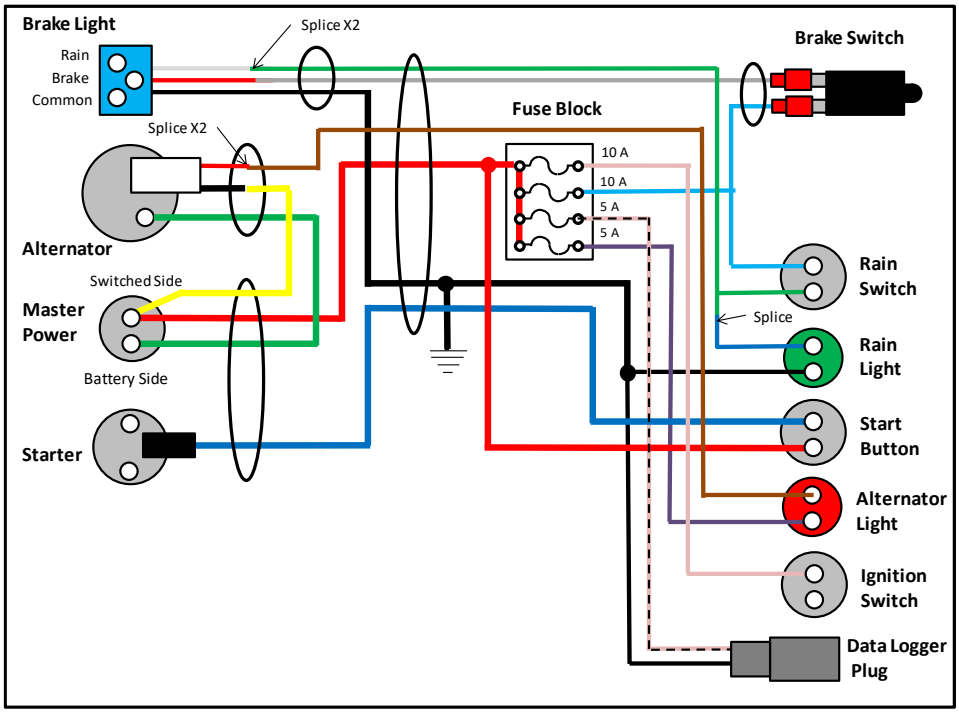


Figure A8 – G3 Chassis Harness Schematic

Dash connections

Color	Size	Connector	Function	Other
Pink	18	#8 Ring Lug	IGN switch from Fuse panel	10 Amp
Blue	18	#8 Ring Lug	Rain light switch from Fuse panel	10 Amp
Green	18	#8 Ring Lug	Rain light from rain light switch	
Blue	18	.25” Spade	Brake light switch from Fuse panel	
Grey	18	.25” Spade	Brake light from brake light switch	
D Blue	18	F Bullet	Alternator charge light from fuse panel	5 Amp
Brown	18	F Bullet	Charge bulb to alternator “T” plug	
Red	12	#10 Ring Lug	Starter switch from master switch	Not Fused
D Blue	12	#10 Ring Lug	Starter switch from starter switch	
Black	12	5/16 Ring Lug	Ground to battery ground lug on frame	

ECU Plug - Female Molex 2 Position

Color	Size	Connector	Function	Other
Pink	18	P1	Power to data system 2	5 Amp
Black	18	P2	Main ground for data system	

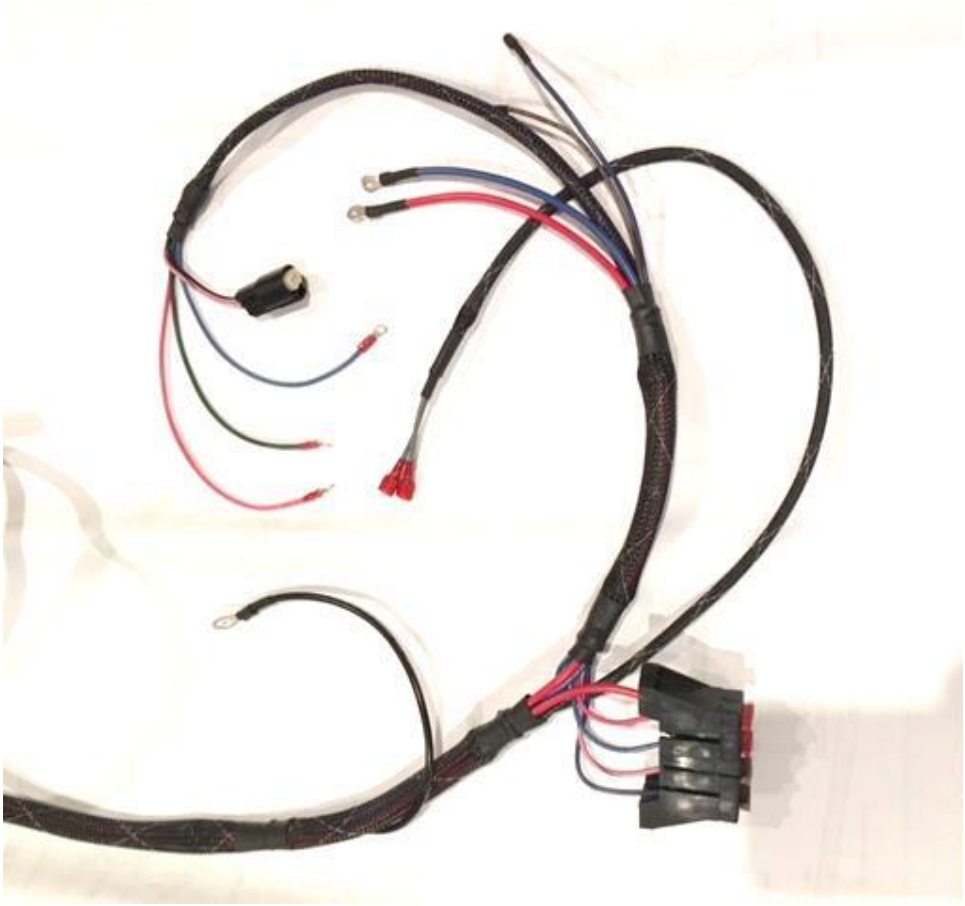


Figure A9 – G3 Chassis Harness – Dash End

Alternator

Color	Size	Connector	Function
Red	18	T1	Battery side of master to charge light
Black	18	T2	Brown field charge from the dash charge light
Green	12	1/4” Ring Lug	Alternator output stud to Master switch

Starter

Color	Size	Connector	Function
D Blue	12	1P Packard	Starter Solenoid from starter switch

Brake light connector

Color	Size	Connector	Function
White	18	P1	Splice to black to chassis ground eyelet
Red	18	P2	Splice to grey to brake light switch
Black	12	P3	Splice to green to rain light switch

Master Switch

Color	Size	Connector	Function
Yellow	18	3/8” Ring Lug	Switched side of master to Alternator

Red	12	3/8” Ring Lug	Switched side of master to fuse panel
Green	12	3/8” Ring Lug	Battery side of master to Alternator

Figure A10 – G3 Chassis Harness – Rear End

12.5. Battery Cable Harness - G1190502

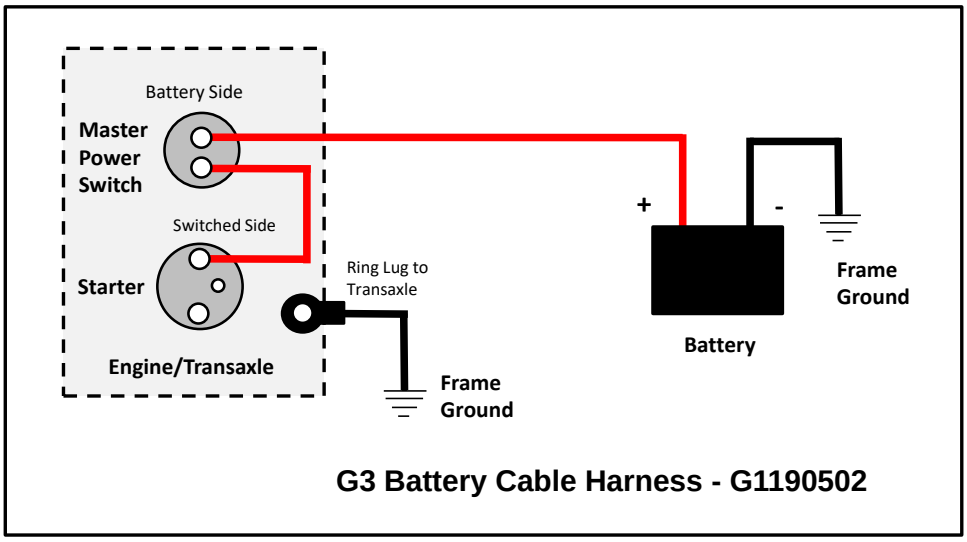


Figure A11 – G3 Battery Cable Harness Schematic

Connections

Color	Size	Connector	Function	Length
Red	6	5/16 & 3/8” Lug	From battery to master power switch	74
Red	6	5/16 & 3/8” Lug	From master power switch to starter	24
Black	6	5/16” Lug X 2	From battery to frame ground	13
Black	6	5/16” Lug X 2	From block to frame ground	13

Figure A12 – G3 Battery Cable Harness

12.6. AIM Dash Interface Harness

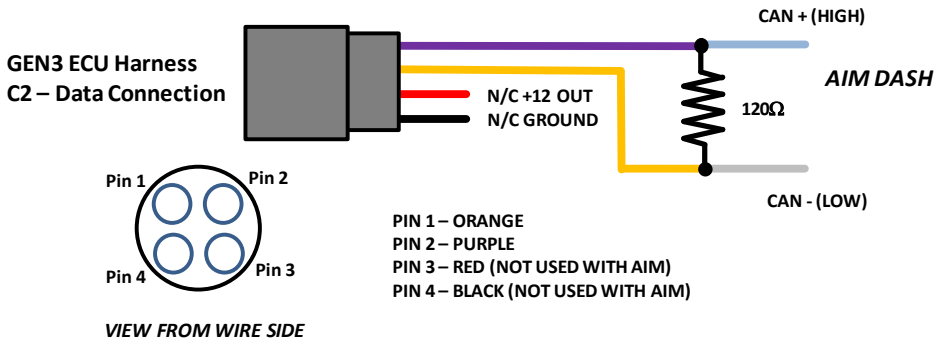


Figure A13 – AIM Dash Interface Harness Schematic

13. Appendix F – Cooling System Block Diagram

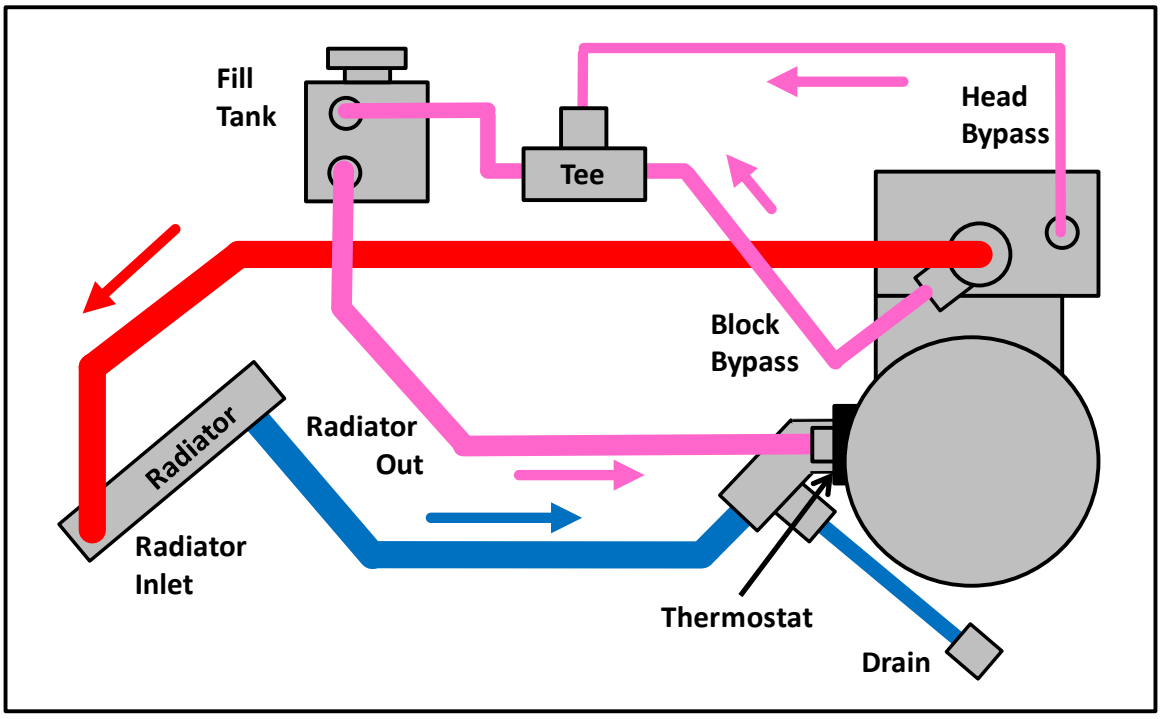


Figure A14 – Cooling System Block Diagram

14. Appendix G – Revision History

Rev	Date	Notes
1	1/8/18	Initial Release