



## CMGS and Vari-Cool II user guide

User guide and configuration setup for CMGS and Vari-Cool II (VC-II) Progressive Water/Meth Controllers

### CMGS Coolingmist Gauge System (including gas vehicles, diesel and diesel EGT)



### VC-2 FS including gas vehicles, diesel and diesel EGT



### CMGS N/A VACUUM



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**CMGS Models: 0-30 PSI, 1 to 100 PSI and Vacuum (0 to 30 hg)**

**Vari-Cool II models 0-30 PSI**

*CMGS and Vari-Cool II Water Methanol Injection Controllers have identical functionality. The CMGS controller is a 52 MM gauge with CNC Machined Anodized Aluminum. The VC2 is a 3.5 inch X 3.5 Inch panel mount controller with a composite enclosure.*

**CMGS and Vari-Cool II**  
*7 segment LED BLUE*

**CMGS ONLY:**  
*Back plate is black/carbon fiber inlay only.*

*Bezel Choice of Silver or Black or Gunmetal.*

**Vari-Cool II**  
*back plate is black/carbon fiber only.*

**CMGS and VARI-COOL II. Progressive controller, boost gauge, failsafe and flow gauge.**

The CMGS and VARI-COOL 2 are the latest progressive controllers from Coolingmist. To avoid confusion its best to understand that the CMGS and VARI-COOL 2 are identical in function, the only difference is the way the controllers mount. The CMGS is a 52 mm Gauge, the Vari-Cool II is a panel mount type controller. Other than that they are identical in every way.

By default the Vari-Cool II/CMGS kits will proportionally inject your fluid based on your manifold (boost) pressure. This kit gives the most accurate delivery of any kit on the market. Vari-Cool II has been designed from the ground up to give the best performance. Why buy a kit with a controller designed in 2001? Along with the performance gains you will get exceptional driveability and power gains. This can be used on any turbo or supercharged engine, fuel injected or carbureted vehicle. Adjustment range is 1-30 PSI, can be used for turbos running upto 75 PSI. A built in map sensor means simple install. Connect your boost line directly to the Vari-Cool II controller. If you have a 0-5 volt sensor such as a map sensor or mass air flow sensor you can use that instead of the boost port because along with a built in boost sensor Vari-Cool II has a built in 0-5V sensor so this will even work with many naturally aspirated vehicles!!! Version 2 of the CMGS/VC2 have a failsafe built in as well. You need the flow sensor for the failsafe to work. Details on setup are later in this document Not all kits will have the failsafe flash as some kits are priced with different options.

So what sets this apart? Lets discuss a few features.

**DISPLAY OPTIONS**

This unit has a display that by default will display boost pressure (assuming you have a boost port connected to the unit). You can actually configure this unit to display the pump dutycycle OR a 0-5V input. you can even set a multiplier to show the voltage as a meaningful value if you wish. This unit has a flow sensor input so if you purchase our flow sensor you can see the flow rate across the top of the controller. There is a fault input that can connect to a low level float switch or some other indicator if you wish.

**INJECTION OPTIONS AND FAILSAFE**

By default the Vari-Cool II will inject based on boost. its progressive. You set the MIN/MAX boost and as boost increases so does the flow rate. You can set the Injection start and injection full flow between 1 and 30 psi. Lets say you set the MIN at 5 and max at 25, the system will not turn on until 5 psi and will be at full flow by 25 psi. After 25 psi the system would be at full flow rate. How do you set the MIN/MAX setting on the Vari-Cool II or CMGS? When in run mode you turn the min or max and the value will show up on the 3 digit digital display. Once you stop, after 5 seconds it will display your boost again. You can configure the unit to inject based on voltage instead. Lets say you have a Mass Air Flow sensor that gives a 0-5V value. You can set the minimum voltage and max voltage and make it inject based on those values. A really cool feature is the ability to give values to the voltage. By setting the multiplier you can do this. How does it work? Lets say that 5 volts is 500 CFM (Just an example) set the multiplier to 100, instead of adjusting min/max voltage you can adjust min/max CFM. You can also display the CFM on the unit instead of voltage if you wish. The CMGS/VC2 are a full featured failsafe (requires flow sensor). You can detect low flow, high flow or low fluid level and activate/deactivate any device based on that.

**MULTIPLE INPUTS**

What if you want to inject based on 2 inputs? you can do that easily. Why would you want to? See the following example. Lets say you have a supercharger that is at full boost by 1400 RPM or a super fast spooling turbo setup. If you inject on just boost, you will be at full flow by that 1400 RPM leaving most of the RPM band at the same flow rate. Not that effective. Now take the same example and inject based on boost and 0-5V MASS AIR FLOW READING. You can set the system to inject based on boost and voltage. You set the min/max boost on the controller min/max knobs during run mode and you set min/max voltage in the configuration. The system will then create a map between the min/max boost and min/max maf. Any change in boost or maf will create a change in flow. If you have our flow sensor it will display flow in addition to your choice of boost, dutycycle of pump or voltage (MAF VALUE)

You can set the MIN/MAX dutycycle between 1 and 100%. This allows you to tune down or up the injection nozzle flow rate. A little too much flow? Set the dutycycle max lower. Getting too much flow on the low end? Set the min dutycycle lower.

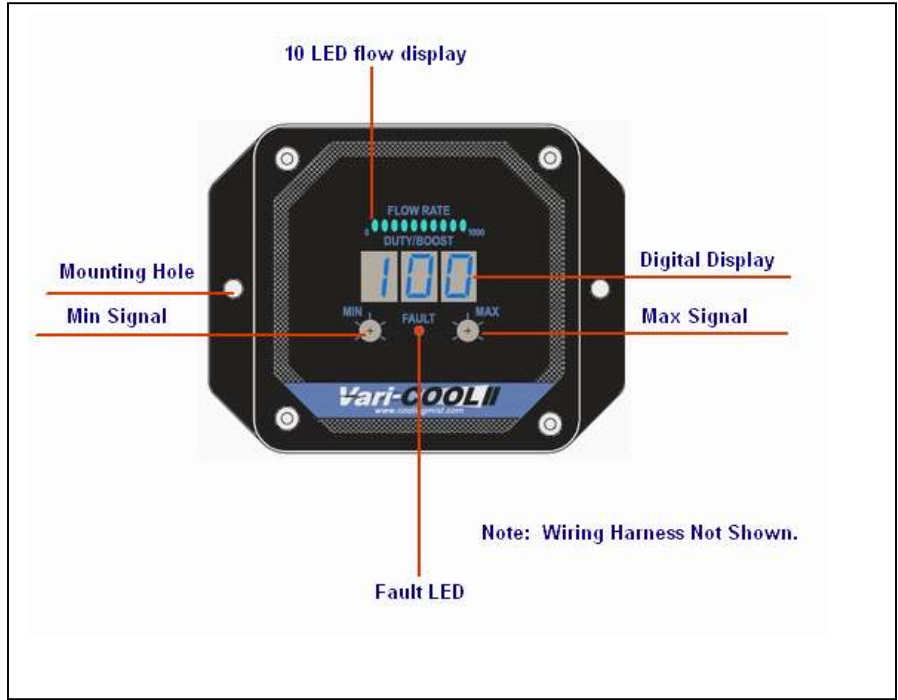
There are 10 bars across the top of the controller. If you have our flow sensor each bar will equal 100 CC/M. If you run alot more flow, you can set the unit so each bar means 200 CC/M for a total of 2000 CC/M. Flow sensor is an option, not required. You can set the brightness of the 10 bars across the top of the unit in configuration mode as well.

**HOW TO CONFIGURE THE CMGS AND VARI-COOL II CONTROLLERS**

By default the unit will display boost and inject based on boost only. To change any of the configuration its simple. Turn the MIN and MAX both to 1. The screen will count down 5, 4, 3, 2, 1, at 0 you will be in configuration mode. The 10 bars across the top of the Vari-Cool II controller will each have a function. The MAX knob will be used to select the bar, the min knob will set the value. For example, if you want to display the pump dutycycle and inject based on voltage instead of boost you would turn go into configuration mode and then light up the first LED on the 10 digit BAR. Once its lit you are ready to configure the first param which is display. Use the MIN knob to set it to 001. 001 is dutycycle (000 is boost). To set the injection you will then move to the 2nd bar using the MAX knob. Turn the MIN knob until the 3 digit display in the middle shows 001 (001 is voltage injection). If you dont want to set any of the other 8 params you will turn the max knob all the way until it stops turning and then do the same with the min knob. Once you lower the min knob it will be saved and you will be in run mode. Just set the MIN and MAX boost and you are ready to go.

**PLEASE NOTE: your CMGS or Vari-COOL II controllers by default will inject based on boost only and will display boost. If that is what you want, you do not need to change any of the params. If you wish to inject based on more than 1 input, you can configure the unit to do so without the need for any PC!!!**

The CMGS and Vari-Cool II has 3 operating modes. Startup, Configuration, and Run mode. By using simple menu commands you can program or configure your unit to inject based on more than one input, set the min/max range of both inputs, change the curve, calibrate the flow sensor, display boost, etc. The features above and many more will be shown in great detail below.



**Startup Mode**

Startup mode occurs only after power is initially applied to the CMGS. There is a 10 second delay where all outputs are off and inputs are ignored. During the startup mode the 3 digit display displays “000” and the Fault LED flashes at a slow rate.

**Run Mode**

Run Mode occurs after the Startup Mode timeout. Inputs are read and outputs set accordingly as configured. The min and max Set Point potentiometers can be adjusted. Changing either set point potentiometer causes the 3 digit display to briefly display the set point value. After a short time out period the 3 digit display returns to the configured display value. When in the Boost control mode the min and max set point potentiometers display Boost values 1.0 – 30.0PSI. When in Voltage control mode the set point potentiometers are displayed in Voltage values. When in Combined control mode the min and max set point values for Boost are set in the Run Mode using the Min and Max set point adjustment knobs. The Voltage set points are set in the Configuration mode. Reference the Configuration Mode for details on the Configuration setup of the Voltage Min and Max set points to be used in the Combined control mode.

**Fault Input**

The Fault LED is tied to the Fault Input in the run mode. When the Fault Input goes active (pulled low to ground), the Fault LED will be illuminated indicating a Fault state. The CMGS continues operation even if the Fault Input is active. If you have the failsafe activated (flash version 2 only of CMGS) the failsafe will be tripped when the fluid is low.

**Flow Rate Bar Graph**

The Flow Rate bar graph displays the measured amount of liquid flow. The Flow Rate bar graph can display flow rates of 100 – 1000ml or 100 – 2000ml. The Flow Rate bar graph range is configured in configuration. When in 100-1000ml range, each LED represents 100ml of flow. When in 100-2000ml range, each LED represents 200ml of flow.

**Flow Input**

The Flow Input receives pulses from Coolingmist Flow Sensor and is based on a flow sensor with 22000 pulses/liter of fluid.

**PWM Output**

The Motor Output is a PWM control signal and operates at ~400Hz providing 0 -100% duty cycle. The output is varied based on the configuration and the min and max set points.

**0-5 Volt Boost Reference Output**

A 5V analog output when control is based on the Boost Input is varied 0 -5V for 1 – 30PSI boost

**Ground Output (used for failsafe mode)**

The yellow wire (aux output) is switched on or off based on failsafe setup. You can manipulate a wastegate or electronic boost controller.

**Flow bars:** By default the flow bars equal 50 CC/M each for a total of 500 CC/M. You can change to 100 or 200, for 1000 or 2000 CCM. You must match the setup to your flow rate. If you are running greater than 500 CC/M, you will need to adjust the CMGS to to 100 CC/M for each bar. If you are running more than 1,000 CC/M you will need to change to 200 CC/M per bar. Otherwise when you exceed the CC/M its configured for the bars will stop lighting up. This is because the unit is expecting a max flow and if its exceeded it blanks the bars out.

The CMGS FS and VC2 FS are by default setup to inject based on boost, display boost and flow rate with no failsafe. If this is what you want, do not proceed further. Your CMGS is already setup by default. If you want to inject based on voltage or boost and voltage or if you want to display something other than boost or want to activate the failsafe you will need to understand how CMGS FS works. Before anything can happen we must get CMGS into configuration mode. To do this set the MIN and MAX both the 1 and the CMGS will count down from 5. Once at zero the screen will come back and the fault light will blink steady. This is configuration mode.

Across the top of the CMGS you have 10 flow bars. During injection the flow bars light up telling you how much you are flowing. These same bars are used during configuration mode to indicate what parameter you are on. In figure A, all 10 bars are lit up. In Figure B, 3 bars are lit up. These would be 2 different parameters. There are 18 different parameters that you can set and each parameter can have 2 to 7 different options.

Now we know the number of flow bars that are lit will tell us what parameter we are on, we must know how to change the value and advance to the next parameter. When you first get into configuration mode the first led will be lit up. You are ready to either change this parameter or move to the next. We will discuss what each parameter is in the next section. To move to the next parameter you would turn the MAX dial until the 2<sup>nd</sup> LED is lit up. If you wanted to change that parameter you would turn the MIN knob clockwise until the 3 digit display shows the value you want. Its very important not to accidentally copy the value you just set onto the next parameter. When you advance to the next parameter you have 1 second from the time you turn to the next parameter until the value shows up on the screen. If you are not going to change that parameter you must move to the next one before the screen comes back. If you do not, you will copy your previous value over. This is only a factor when you have changed the previous value. You may have noticed that there are 18 parameters but only 10 bars. How to change the other 8? Its simple. When you advance past #10, the flow bars will wrap around and the fault led will blink rapidly. So the 2<sup>nd</sup> time around when the first bar is lit, that is parameter #11 and so forth. Once you have finished changing any params, to save your changes set the MAX all the way to the right and set the min all the way to the right. You have saved your changes and exited config mode. If you ever need to reset the CMGS/VC2 back to its default setting, just set the MIN to 30, MAX to 30, turn power off and then turn power back on and wait 10 seconds.

To get a visual idea of how this all works see us at [www.coolingmist.com/videos.aspx](http://www.coolingmist.com/videos.aspx). We have dozens of videos showing most of these features being setup. We strongly recommend you view them if you have any questions about this. **NOTE: to get your CMGS version #, at startup the version number will flash for about 10 seconds.**

On the next page we will discuss each parameter, what they do and what the values are. Its up to you to decide if you need the functionality of any of these params. **DO NOT JUST CHANGE A PARAM BECAUSE IT SEEMS COOL, ONLY CHANGE IT IF YOU HAVE A REASON TO.**



*TIP: To check your values after you program the unit, go back into confi mode and keep the MIN setting all the way to the left. The first param value will show on the screen. Write that down then move the MAX knob clockwise onto the next led to get the next value and so forth. Write each value down. From there you can compare to the chart to make sure everything is good exit config mode by turning max to 30 and min to 30..*

PARAM (# LEDS lit up)	PARAM FUNCTION	VALUES (DEFAULT IN BOLD)	NOTES:
	Display Mode	<b>000 Boost Display</b>	Displays 0.1 to 30.0 PSI of boost
		001 Dutyycle Dsiplay	Display pump DC % from 0 to 100
		002 Voltage Display	Displays the voltage 0.1 to 5.0 or the multiplied calculation if setup
		003 Flow Display	Displays flow in CC/M * 100
2	Control Mode	<b>000 Boost Only Injection</b>	Only considers boost for injection
		001 0-5 Volt only Injection	Only considers voltage for injection
		002 Combined Mode (boost and 0-5V)	Looks at boost and voltage. Can do boost injection with voltage threshold or do a user defined map between the boost and voltage. System will not turn on until MIN boost, MAX boost, MIN voltage and MAX voltage are reached.
3	Minimum Dutyycle	0 to 100 %. <b>25% default</b>	This is the minimum % the controller sends the pump during initial turn on.
4	Maximum Dutyycle	0 to 100% <b>100% default</b>	This is the maximum % the controller sends to the pump at full boost or signal. For example if you set this to 75%, the system will scale your MIN dutyycle at the initial turn on and when you are at full flow you will only see 75%. If you need to lower the flow rate, this is the ideal way to do it.
5	5 Volt Multiplier	0 to 100. <b>1 is default</b>	If you are injecting based on voltage or combined mode or displaying voltage you can set the multiplier. For example, if you are integrating throttle position or displaying throttle position and 5 volts =100% throttle, you set the multiplier to 20. Your display will show 0 to 100% instead of 1 to 5.
6	Flow Input Pulse Liter	150 to 450 <b>220 is default</b>	If your flow sensor is in the trunk you should adjust this number to around 270 for an average vehicle. If your flow sensor is under the hood, you can leave at its default. This param affects how the flow sensor reads. The further away from the engine the larger the number should be.
7	Flow Bar Configuration	<b>000: Each bar=50 CC/M</b> 001: Each bar=100 CC/M 002: Each bar=200 CC/M	For lower flow rates the default of 50CC per bar (500 CC total) is ideal. This is display purpose only.
8	Flow Bar Dimmer	<b>1-4</b>	<b>4 is the brightest, 1 is the most dim.</b>
9	5 Volt MIN Set Point	0.0 to 5.0 V. <b>1 is default</b> (only avail in combined mode)	If you have combined mode chosen you will get this option. This is the minimum voltage for turn on.
10	5 Volt MAX Set Point	0.0 to 5.0 V <b>5.0 is the default</b> (only available in combined mode)	This is the Max voltage for injection <b>(COMBINED MODE ONLY)</b>

PARAM #	FUNCTION	VALUES	NOTES
11	5 V Input Weight Pct	0 to 100% <b>50% default</b> (only avail in combined mode)	If you set this value to 0, the system will inject based on only boost, but only when you are above your 5 V min voltage setting. If you set the value to 100, the system will inject based on only Voltage but will use the min boost setting as the boost threshold. The closer you are to 100, the more control you give to the voltage. For example, set it to 50 and boost and voltage have equal weight. Any change in boost or voltage will change the map equally. Set the value to 75 and voltage has 3 times the weight at boost meaning change in boost will not change the flow as much as change in voltage will.
12	5 V Output Mode <b>(Orange wire)</b>	000- 5V Output is scaled to the Flow Rate Input value. (100ml = 0.1V)	Outputs .1 volts for every 100 CC/M of flow. At 2.5 volts you are at 2500 CC/M. <b>Some tuning boxes for the BMW 135I/335I use this output from this.</b> The more CMGS flows the more boost your BMW will safely get.
		<b>001 – 5V Output puts out 5V when the Flow Rate Input satisfies the Fail Safe Flow Rate Min and Max settings.</b>	Outputs 5V when the system is flowing and you are flowing. Newer versions of the JB3 use this function to advance boost to the BMW 135/335I but only when flowing correctly within your setup parameters.
		002 – 5V Output puts out 5V when the Flow Rate Input satisfies the Fail Safe Flow Rate Min and Max settings and the Duty Cycle, Boost, or Voltage exceeds the Min Threshold as configured.	Is exactly the same as 001, except it will look at your boost threshold, voltage or dutycycle threshold as well.
		003 – 5V Output is scaled to the Boost Input value (0 PSI, 0.0V – 30 PSI, 5.0V)	0V=0 boost. 5V=30 psi orange wire
13	Failsafe Enable	<b>000- Fail Safe feature is disabled</b>	If failsafe is disabled, all values below are disabled as well. There are default values for each of these, but they are only active if the failsafe is enabled.
		<b>001 – Fail Safe feature is enabled using Duty Cycle</b>	If you are injecting n combined mode, dutycycle is the best way to use the failsafe.
		002 – Fail Safe feature is enabled using Boost	This is the most common setting.
		003 – Fail Safe feature is enabled using 5V Input	
14	Failsafe Min Threshold	<b>The Fail Safe Min Threshold value is displayed based on the Fail Safe enable. If Fail Safe is enabled for Duty Cycle the Fail Safe Min Threshold range is 0 – 100% with 60 % as the default. When enabled for Boost, the range is 0 – 30 and default is 12 psi. If enabled for the 5V Input the range is displayed using the current 5V Multiplier configuration setting and 3 v is the default. When the Fail Safe Feature is disabled this configuration setting is not displayed.</b>	The threshold is critical. If you the aux output (yellow wire) setup for “000”, “001” or “003” the system looks at your threshold before it will trigger the failsafe. For example, If you set the threshold to 12 PSI, until you reach 12 PSI or beyond the system could care less what your flow rate is. You should set this threshold early enough so that it will catch any flow problem early.
15	Flow Min Threshold	10 to 200. <b>default 17 (170 ML/M)</b>	From 100 CC/M to 2000 CC/M. Value of 10 = 100, value of 150=1500, etc. If you set this value too high your failsafe can trip before you reach that flow rate. Make sure the value you set is realistic based on your controller settings and jet size.

LED #	PARAM NAME	VALUE	NOTES
16	Flow Max Threshold	0 to 200 <b>default 0</b>	This is optional. This value allows the cmgs to know if your hose bursts or you have an over flow problem. If you don't set this you would never know if you have an over flow.
17	Failsafe Aux Output <i>(these settings give or take away a ground to the yellow wire. Use a relay if you want voltage)</i>	000 – Aux Output Normally Open (Aux Output is normally off and activates when fail safe is triggered).	This is great to be used with any device you need to turn on when there is a flow problem. The <b>Subaru WRX/STI</b> uses this feature. The yellow wire connects to the green test connector and its setup with "000". Test connector is grounded when a problem occurs causing boost/timing to retard.
		001 – Aux Output Normally Closed (Aux Output is normally active and deactivates when the Fail Safe is triggered).	This setting can be used for example if you have a boost controller that you always want on until there is a problem and you want to deactivate it. Can be used for a number of situations. Always has a ground unless you are within your flow window and a problem occurs.
		002 – Aux Output Normally Closed (Aux Output is normally active only when the Flow Rate Input exceeds the Flow Rate Min setting and is less than the Flow Rate Max setting when set. Aux Output deactivates when the previous condition is not satisfied).	This differs from 001 because it does not give the ground output until you are within your flow rate min and flow rate max. It does not care about your threshold of boost, voltage or dutycycle. Looks at min/max flow only.
		003– Aux Output Normally Closed (Aux Output is normally active only when the Flow Rate Input exceeds the Flow Rate Min setting and is less than the Flow Rate Max setting when set, and the Duty Cycle, Boost, or Voltage Min Threshold is exceeded. Aux Output deactivates when the previous conditions are not satisfied).	Same as 002, except it factors in your dutycycle, boost or voltage threshold. If it is not met, it will not give the ground signal even if its within the flow range.
18	Failsafe Response Time	A pause can be programmed from 0 to 2 seconds. Values are valid from 0 to 200. Pauses before failsafe output wire is triggered . <b>Defaults to 10</b>	The pump takes time to get up to speed and the lines take time to fill with fluid. The further your flow sensor from the pump the longer this needs to be. This is the amount of time for the system to pause prior to tripping the failsafe. If you get a "001" flashing on your CMGS you may need to set this delay. You want this delay as short as possible.
19 For V1.06 this is param #17	Bar Graph Configuration	000-Display Flow Rate (default)	By default the 10 flow bars will show your flow rate (50 cc/m, 100 cc/m or 200 cc/m per bar) when you are injecting. You can however make this display pump dutycycle with each bar equaling 10 % dutycycle. Why would you do this? Lets see you set the display mode to 003 so the 3 digit display shows flow instead of boost, you may not want the bars to show flow as well.
		001-Display Dutycycle	See above ☺

**PUMP:** Depending on what model you purchased you will have the 150 psi pump or the high pressure 200-250 PSI pump. The high pressure psi pump is pre-set to 200 PSI. If you need to adjust turn hex key ¼ turn to the right to adjust to 250 PSI. The 150 psi pump is not adjustable. If your kit has a checkvalve you must install the pump below the tank to gravity feed (except with our trunkmount tank). Pump should be no more than 6 feet from the tank.

**INJECTOR:** If you ordered dual injectors or multi port setup you will receive equal sized nozzles sized to your horsepower range. If you order with the standard setup you will receive 1 injector sized to your horsepower range. The injector is 1/8<sup>th</sup> NPT. You should tap the pipe between the intercooler and the throttle body. For carb setups you may need a spacer plate. For roots style superchargers you will need to inject prior to the supercharger. The injector is a 1/8<sup>th</sup> NPT. You need a 27 thread per inch standard tap and a 11/32 drill bit to drill the hole. If you have multiple jets try to space them atleast 6 inches apart. VC2 FS will ship with a M5 and M10 injector standard

**WIRING:** Your kit will ship standard with 20 feet of primary wire. This is sufficient for most installations. Under some circumstances you may need more wiring. Always use 16 gauge wire for power/ground and 22 gauge for the smaller signal wires.

**FILTER, FLUID CONTROL DEVICE and FLOW SENSOR:** our CMGS-FS, VC2-FS kits ship with a flow sensor, fluid filter and fluid control valve as standard. See page 10 for IMPORTANT information as how to assemble them. On VC-2 Stage 1 kits you will receive a checkvalve that will be intalled inline between the pump and injector. Flow sensor will display flow rate on the CMGS/VC2. by default each bar is 50 CC/M for a total of 500 CC/M. You can set it so each bar is 100 or 200 for a total of 1000 or 2000 CC/M.

The fluid control valve and filter will connect directly to the flow sensor. This is a requirement for correct reading. The flow sensor is sensitive to turbulence and the valve/filter will eliminate the turbulence before entering the flow sensor.

**OPTIONAL LOW LEVEL SWITCH:** Install the low level switch into the bottom of the tank. One wire goes to GROUND the other wire connects to the green 22 gauge wire on the CMGS/VC2. when you are low on fluid it will light up the fault light. The CMGS-FS and VC2-FS kits have the low level switch standard. If you activated the failsafe a low fluid condition will activate the failsafe.

**CMGS/VC2 CONTROLLERS:** The VC2/CMGS inject based on boost only by default. This can be changed in the configuration. Set the min/max boost on the controller by turning the knob clockwise. The VC2/CMGS will display boost by default. You can make it display the dutycycle of the pump or voltage if you wish. See the configuration details in the document listed above. **The diagrams above are identical whether you have the CMGS or VC2. THESE CONTROLLERS READ BOOST, NOT VACUUM.**

**TANK:** Your kit may have no tank, or our 1 gallon or 1.5 gallon tank. If you use your own tank we provide a small 1/8<sup>th</sup> NPT fitting for the bottom of the tank. It's the same fitting as connects to the injector elbow. See pages 12-13 for pictures.

**SCREWS:** Your kit has screws to mount the pump and tank.

**FITTINGS:** Fittings vary depending on tank option.

**VACUUM HOSE:** Your kit will ship with plastic hose used for the boost pressure. This hose is black. The white hose is used for fluid on the 250 psi kits. For the 150 psi kits use the black hose for both air and fluid.

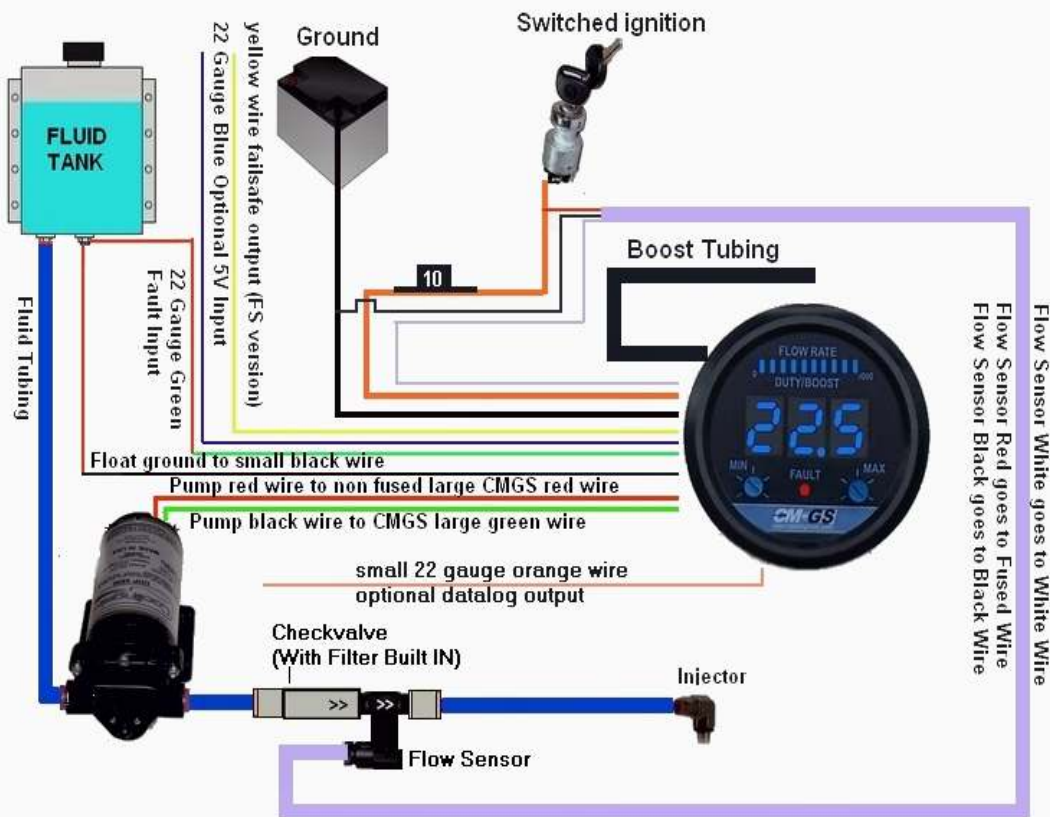
**99% OF YOUR QUESTIONS SHOULD BE ANSWERED IF YOU READ THIS GUIDE. DUE TO THE FACT THAT THIS IS A UNIVERSAL KIT YOU MAY HAVE SOME UNANSWERED QUESTIONS. EMAIL TECH SUPPORT OR CALL US IF YOU HAVE QUESTIONS.**

**DO NOT CONNECT ANY POWER SOURCE TO ANY OF THE BLACK WIRES OR THE SMALL ORANGE WIRE. DOING SO WILL DAMAGE THE UNIT AND VOID YOUR WARRANTY.**

# UNIVERSAL CMGS AND VC2 Diagram.....

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## CMGS FS Universal Diagram



For CMGS 12V power wire is always HEAVY GAUGE ORANGE it may have a fuse connected to it or you may be given an external fuse. You MUST ALWAYS have 15 amp fuse on the power wire.

VC2 may have a heavy gauge orange or heavy gauge red wire as the power. VC2 always has a fuse attached to the power wire.

SMALL ORANGE, Yellow and Blue

Small 22 gauge orange wire is a programmable 0-5V output

Small yellow wire is optional failsafe output (ground).

Small blue wire is 0-5V input used for optional MAF or TPS not used if you inject based on only boost

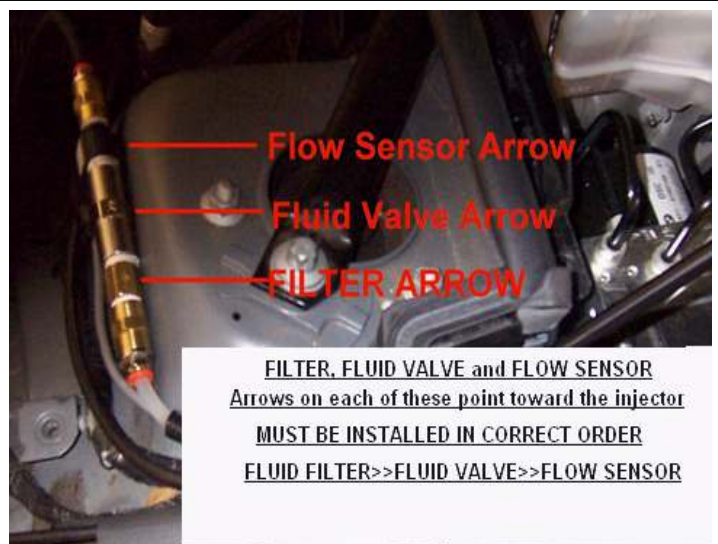
**NOTE:** the picture below shows an external filter connected to the inlet of the checkvalve. All kits sold after 5/15/2010 will have the filter built INTO the checkvalve so you will not get an external filter. This makes the kit easier to install and eliminates a few points of failure.

**IMPORTANT!!** When you install the flow sensor, you must keep the flow sensor so it does not shake or move. You can put Velcro on the flow sensor to hold it down or you can use zip ties. Never, ever leave the flow sensor lay on the trunk floor or lay inline so it can shake back and forth and hit the walls. This can and will damage the flow sensor.

### NOTE:

The picture to the right shows the assembly of the Filter, valve and flow sensor. They must be installed in the order with all 3 of the arrows pointing toward the injector. You may receive this already assembled or you may need to assemble yourself. Pipe tape goes on all of the threads. Always test for leakage. Installing any of these backwards will damage the flow sensor.

**NOTE: FLOW SENSOR SHOULD BE INSTALLED AS CLOSE TO THE PUMP AS POSSIBLE. IF YOU ARE INSTALLING THE PUMP IN THE TRUNK INSTALL THE FLOW SENSOR/VALVE/FILTER 12 INCHES OR LESS FROM THE PUMP. THE CLOSER THE FLOW SENSOR THE BETTER RESPONSE YOU WILL HAVE. YOU MUST CHANGE THE MIN DUTYCYCLE TO 10% AND THE FLOW CALIBRATION TO 270. YOU CAN SEE PAGES 5:1 AND 6:1 FOR DETAILS ON HOW TO SET THESE.**



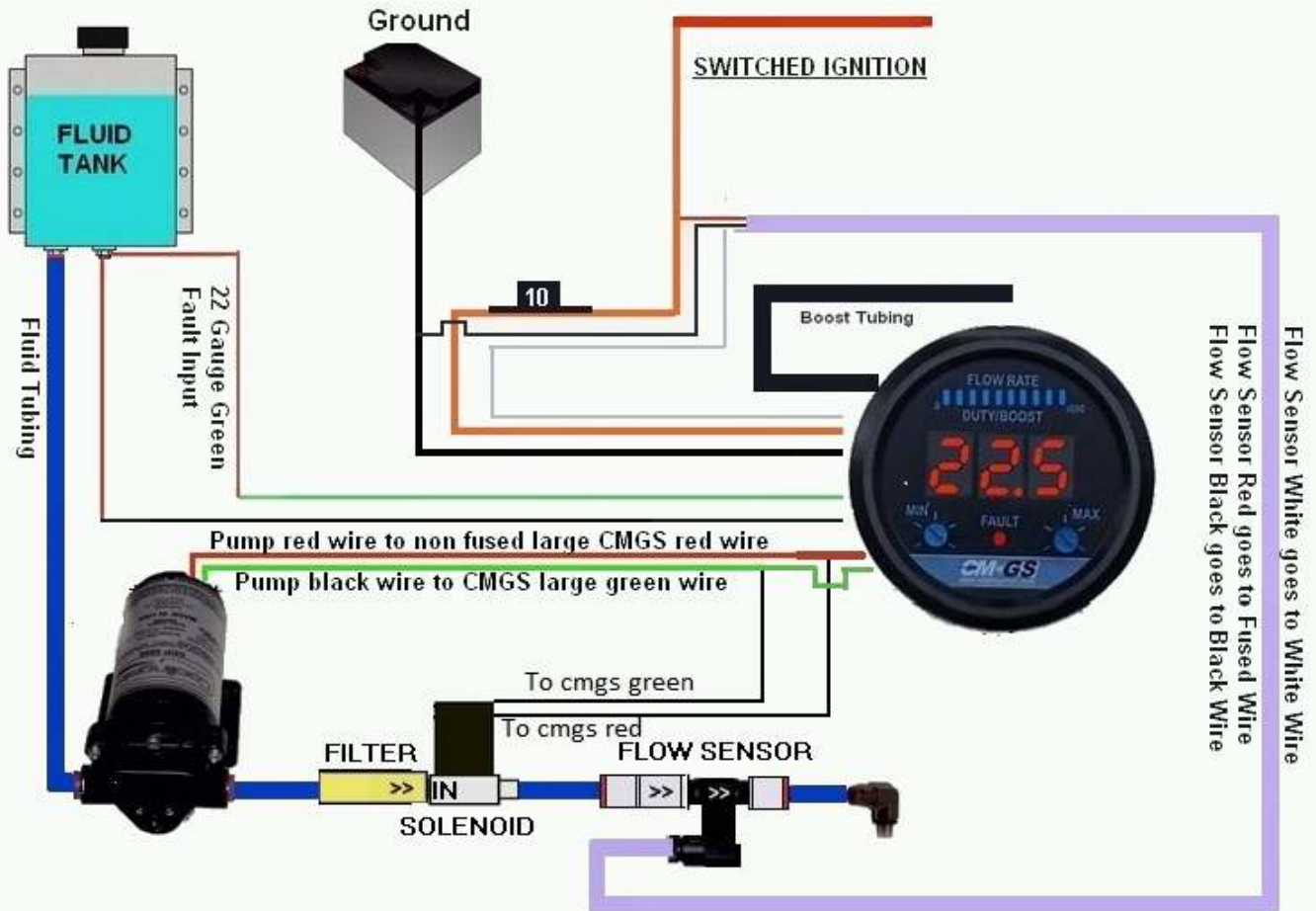
FILTER, FLUID VALVE and FLOW SENSOR  
Arrows on each of these point toward the injector  
MUST BE INSTALLED IN CORRECT ORDER  
FILTER>>FLUID VALVE>>FLOW SENSOR

# UNIVERSAL CMGS FS and VC2 FS diagram with SOLENOID option



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CMGS FS



NOTE: MIN dutycycle must be set at 35% or higher.  
Filter must be placed prior to the solenoid

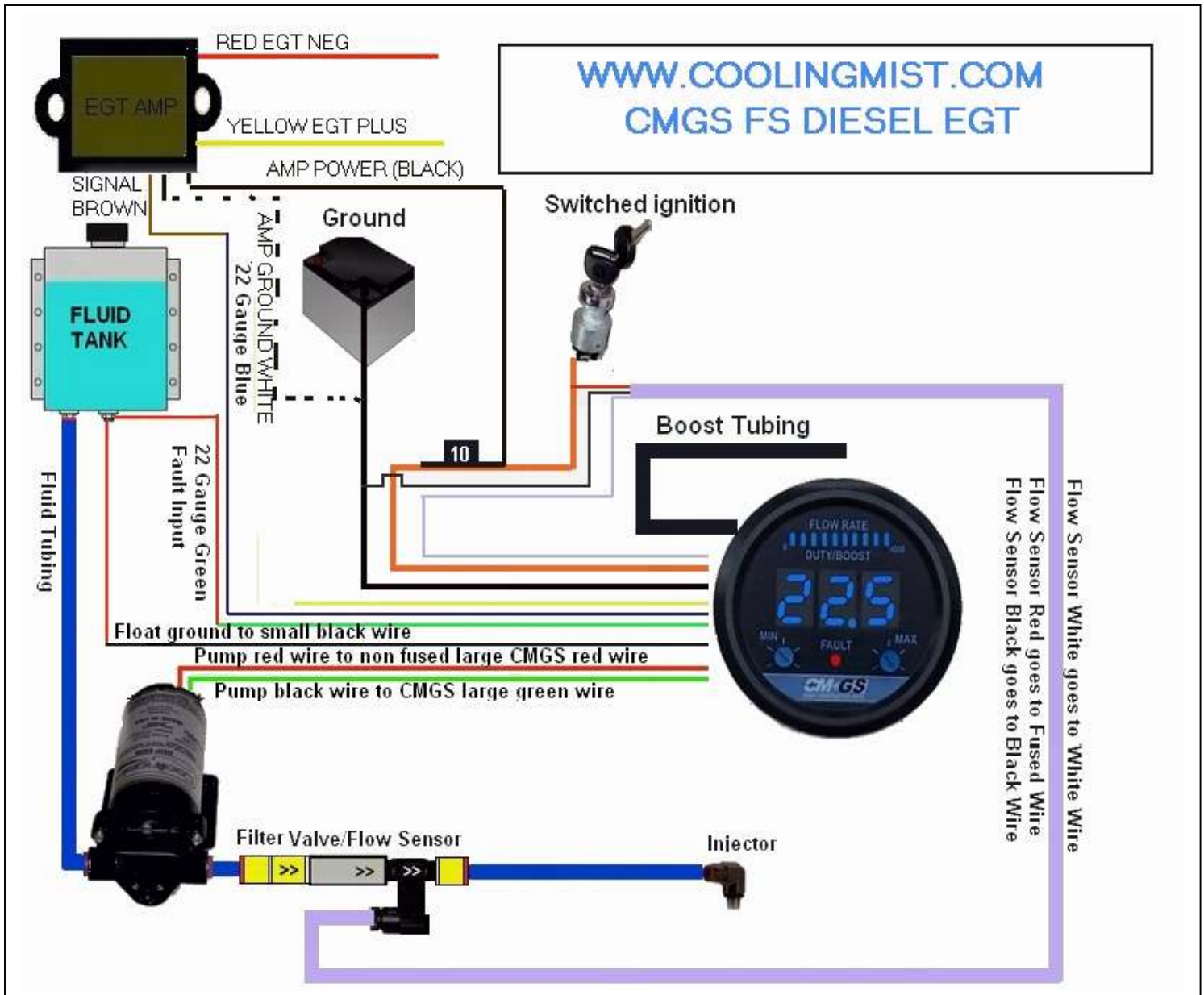
**SOLENOID VERSION**

. Its important to note that the VC2 may have a large red wire instead of orange for the power!! THE FUSED WIRE ON THE VC2 IS ALWAYS THE POWER WIRE REGARDLESS OF THE COLOR OF THE WIRE

**NOTE: FOR THOSE OF YOU THAT Have THE VACUUM BASED CONTROLLER:** (THIS DOES NOT APPLY TO THE BOOSTED VERSION)

The vacuum version of the cmgs injects progressively based on reducing vacuum. Version is 3.07. Everything in this document applies to the vacuum version as well. When you set the vacuum version the MIN dial is the low vacuum and the MAX dial is the high vacuum. For example, if you set the MIN to 3 and the max to 12, the system will not turn on until you reduce to 12 and it will inject more until you reach 3 or beyond where it will be at full flow. There is a 10 second delay at startup so when you turn the key the CMGS vacuum controller will not turn on. If you wait past the 10 seconds the Controller will start injecting. This is because the vacuum based controller injects based on low vacuum, when the engine is off there is no vacuum. For this reason its very important not to let the cmgs vacuum unit power for a long time without the engine running. NEVER connect the cmgs power directly to the battery.

VC2 FS EGT diagram is identical to the CMGS diagram below. . Its important to note that the VC2 may have a large red wire instead of orange for the power!! THE FUSED WIRE ON THE VC2 IS ALWAYS THE POWER WIRE REGARDLESS OF THE COLOR OF THE WIRE.



Yellow failsafe wire can give a ground to a device or remove a ground to a device when a fault is detected (low flow, high flow, out of fluid, hardware problem, clog, etc. If device requires more than 1 amp use a relay) If you have no need for this functionality, if you set the failsafe up, the VC2 (or CMGS) will flash on the screen the error code to tell you what is wrong. You must have the flow sensor installed for failsafe.

**DO NOT CONNECT ANY POWER SOURCE TO ANY OF THE BLACK WIRES OR THE SMALL ORANGE WIRE. DOING SO WILL DAMAGE THE UNIT AND VOID YOUR WARRANTY.**

The trunkmount tank installs just as you see in the picture. Align the base plate with the holes and use the 10/32 screws to secure. Please note the inlet fittings should line up with each other when they are installed. Straps and brackets are provided. Notice how the 90 degree fitting on the left side of pump and the small pick up fitting are horizontal to each other? You will take a piece of boost line and connect those two together (AFTER YOU INSTALL THE PICKUP FITTING TO THE BOTTOM OF THE TANK).

FIGURE A



FIGURE B PICKUP FITTING



**MAKE SURE YOU INSTALL THE FLOW SENSOR AS CLOSE AS POSSIBLE TO THE PUMP OUTLET. WITHIN 6-12 INCHES IS BEST.**

Notice the pickup fitting in figure B? We recommend this so you eliminate the chance of drawing air into the system under acceleration. This allows you to use the full capacity of the tank as well.

In figure C we show you the view through the lid where the pickup fitting would be extended.

FIGURE C



## UNDERHOOD TANK SETUP.



**NOTE:** If you install the flow sensor closer to the pump the response time will be quicker. This is preferred if you have the failsafe feature enabled. If you set it up this way when you first start injecting the flow sensor will appear to spike. All the bars will light up. This is the system letting you know the line is primed. Once the line is fully primed and injection starts the bars will light up as normal. If you do not like this feature you can install the flow sensor closer to the injector, just remember the longer the hose is the longer the response time will be. **NOTE:** kits sold after 5/12/2010 will have the filter built into the checkvalve so you will not have an external filter!

Regardless of what tank you use, the concept will be similar. We will demonstrate on our 1 gallon tank.

**Install the pickup fitting**

In **Figure A** we tap the bottom of the tank for the pickup fitting just use a 11/32 drill bit and tap 1/8<sup>th</sup> NPT. When you are done it will look like **figure B**. No Teflon tape or sealant is needed unless you made the hole too big or did not tap correct.

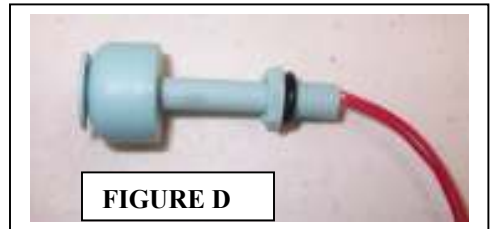
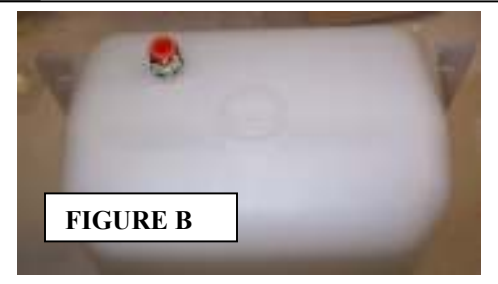
**Install the float switch**

In **figure c** we drill a hole slightly larger than the float switch stem. Remove the nut and put the first oring on the inside stem just like **figure D**.

To route the float switch to the hole we just drilled we need to prepare the float switch. Take a 1 foot section of the nylon hose and put the wires inside it just like **figure E**.

Route the plastic hose from the top of the tank into the hole just like **figure F**. Turn the tank on its side and pull the hose through. Just like in **Figure G**. Now put the oring on the step like in **Figure H** and finally put the nut back on like in **Figure I**.

*Don't forget to test your system for leaks! If the tank leaks at the float switch, make sure the nut is tight. If it still leaks you can seal it with epoxy.*



**FILTER:**

Filter needs to be installed prior to the flow meter. If you have our kit purchased after 5/20/2010 our checkvalve has a filter built into it. Checkvalve should be connected to the inlet of the flow meter with the flow meter arrow pointing toward the injector.

**PIPE TAPE:**

You will need some kind of pipe tape on your flow sensor threads. Its critical that NONE of the pipe tape gets into the flow sensor after you install the fitting. This will cause the sensor to seize.

**TRUNK INSTALL.**

You can install your flow meter in the trunk if you like. If you do this, to get a more accurate reading you need to change the flow meter to calibration (param #6) to 270. this will get you close to the actual reading. If you wish to get a near exact reading see the “optional calibration” below.

**UNDERHOOD INSTALL**

If you install the flow meter under the hood and put the flow meter at the injector no calibration is needed. You can leave the default 220 on param #6. This may make troubleshooting a little more difficult however.

**MOUNTING THE FLOW SENSOR**

Always make sure the flow sensor is mounted securely and away from heat.. Either zip tie the flow sensor or use Velcro to keep it from moving. If the flow sensor is allowed to violently shake during vehicle operation this can lead to long term damage to the sensor.

**OPTIONAL CALIBRATION:**

If you wish to do a 1 time calibration to ensure accurate flow reading follow below.

- 1) Remove the injector from the cars pipe but leave the injector on the hose.
- 2) Set your CMGS display mode to “003” flow
- 3) Spray the injector at full dutycycle for 30 seconds. You can achieve this by using an air compressor into the cmgs/vc2 or you can ground the pump to the chassis with the power on.
- 4) While spraying look at the display on the cmgs to see what it displays. For example if it shows 45, that’s 450 cc/m. Just multiply by 10
- 5) After done spraying measure the ml/m and then multiply by 2. That’s your cc/m. Compare to what the gauge shows. If its close you need to do nothing.
- 6) If that value is too high or too low, set param #6 (flow calibration) to a different number. You don’t need to manually flow the system into a bucket after this point. The number you get when you do that is your correct base flow. From this point you need to flow the system at full flow and change the number (higher or lower) until your flow display most closely matches your base number.
- 7) Save your configuration changes and write the number down incase you reset your cmgs and need to re-calibrate.

**MAINTENANCE and STORAGE OF VEHICLE**

There is very little to do in terms of maintenance with the exception of down time. If your vehicle is going to sit for an extended period of time (greater than a week please do the following to keep the flow sensor clean of deposits. Unscrew the flow sensor and remove the flow from the line, remove your checkvalve/filter and fittings from the flow sensor. You can leave your wiring and cable plugged in. Once you removed the black plastic flow sensor run water through the sensor with a faucet for about 30 seconds. You can re-install your flow sensor back to your vehicle and let it sit as long as you don’t allow water from the tank or hose to go back into the flow sensor. This prevents sitting fluid (methanol, alcohol, water) to evaporate and leave deposits on the flow sensor which will prevent it from working.

## **TROUBLESHOOTING**

If you need to test your flow sensor at any time, this is simple.

- 1) Remove the checkvalve/fittings from the flow sensor
- 2) Give power to your vehicle so the cmgs/vc2 are operational
- 3) Blow into the inlet of the flow sensor and the cmgs/vc2 flow bars should light up.

### **If after the test the flow bars light up:**

- 1) if it does not light up during driving you have a flow problem. The system is not flowing. This is usually caused by the tank drawing air into the line. If your pump is above the tank this can cause this or if you have the trunkmount tank and you do not install the pickup tube during acceleration the water will rush away from the tap and you will draw in air and the system will not flow. To fix this, remove the checkvalve, purge the air and the situation will be resolved.

### **If after the test the flow bars did not light up:**

- 1) Did you hear a whistling sound? You should hear the flow sensor spin with a slight whistle when you blow into it. If not, it may be stuck. Lightly tap the flow sensor body with an instrument to try to free it. If this is successful it will spin and work again. If not, contact us for support. Make sure you always have a filter.

## **TESTING THE FLOW METER CABLE:**

Here is a simple test to determine if your cable is bad. With power to the cmgs simple get the voltage to the white wire on the flow sensor. Voltage should be about ½ of the input voltage. Most car batteries are 12 Volts with key turned and engine off so usually the white wire will be about 5.6-6V. If there is no voltage to the white wire check your wiring and then contact us for support.

If you follow these basic guidelines you will have great success and long life for your flow sensor

## **WIRING:**

Flow sensor black wire goes to ground. This must be a good ground signal. We recommend battery ground but a good chassis ground will do as well.

Flow sensor red goes to 12V switched power. You can connect directly to the cmgs red wire if you like.

Flow sensor white goes to the cmgs white wire.

Make sure you tighten down the screw that comes with the flow sensor, if not the flow sensor will not make good contact with the cable and will give intermittent operation