This thread is to discuss the Honda Gold Wing GL1200 Computerized Fuel Injected (CFI) models, specifically what to do when there is an issue. There is a lot of information out there circulating regarding these CFI models. The issue with these CFI models is the perception of the riding public on whether you should purchase one, or shy away from these. I am not an expert, but have written on the CFI system before.

There are concerns regarding the CFI system, primarily parts/component availability, and who can work/maintain these. A lot of misunderstanding and misconceptions surround these CFI models.

There will always will be alternative parts/components available. Motorcyclists are resilient and always find some way to use an aftermarket part/component to make their preferred ride roadworthy.

Fuel injection systems are slightly more complicated than a carbureted system, but is not beyond comprehension.

Parts/components for the older carbureted systems are quickly becoming harder to find. This has made the single carburetor conversion (SCC) a go to modification for the carbureted Gold Wing. The external alternator conversion – commonly called the "Poorboy", rampant in the older Gold Wing fraternity. Necessity is the mother of invention.

This CFI system was the forerunner of Honda's PM-CFI system that is still in use today. It used a "mapping" system for the various tables required, something the other manufacturers did not use at the time. These tables were not extensive, 3X3 or 4X4, but did the job quite well. The ECU CFI system design utilized Speed Density (SD) and Alpha-N tables to operate the engine depending on where in the RPM/power range the engine is operating.

The ECU contained a pre-start diagnostic program that surveyed the CFI system components for the proper input signal(s).

To understand the CFI system, you need to understand what parts/components make up the system. The number of components/parts for the CFI system is not extensive, but requires a description of each.

The main components of the CFI system are:

Electronic Control Unit (ECU)
Throttle Position Sensor (TPS)
Injectors
Spark Units – commonly called coil drivers
Coils
Air Inlet temperature (AIT)
Coolant Temperature Sensor (CTS)
Crank Sensor (Ns)
Manifold Air Pressure (MAP) – PB sensors 2 in number

Cam shaft rotational speed sensors – GR/GL
Idle Air Control (IAC) circuit
Fuel system

The first tool needed for the work/maintenance of these CFI motorcycles is to get the manuals needed for work/maintenance. These are:

OEM Service Manual
Electrical Troubleshooting Manual
Supplement – need for the CFI system

Without these manuals you can ask a lot of questions, you will get answers but you need to be your own mechanic/diagnostician.

The Supplement describes the CFI parts/components and how each affects the engine operation. This information is critical for an understanding of what the CFI system does. There is a quite a lot of redundancy built into the CFI system that gives the rider a lot of flexibility, and hopefully confidence when something happens.

When an issue occurs with the engine operation, the first order of business is to determine if an error code has been generated by the ECU. If an error code has been generated, the dash indicator light "FUEL SYSTEM" will be lit. This indicator light has nothing to do with the fuel system as the fuel system is not monitored by the ECU.

When an error code is generated by the ECU, you must not turn the ignition key to the "OFF" position. This ECU does not store error codes and as such, turning the ignition key to the "OFF" position will cause the error code to disappear. The error code will not be generated again until the ignition key is turned to the "ON" position and/or the engine is started.

When an error code is generated, you need to look at the ECU error code window and determine which lights are on and/or flashing, then refer to the Supplement to determine what the code is refering to. After this you refer to the appropriate section/pages to find out what must be done.

The ECU is the most critical part of the system. Without an ECU the motorcycle becomes a lawn ornament, a boat anchor, or a candidate for conversion back to a carbureted system.

These ECUs are old technology, availability is not plentiful, and when a used ECU can be found, it generally commands a good dollar.

I have not found a new source of supply for these units, but have embarked on an OEM ECU replacement/upgrade project using the Speeduino Project. There are other aftermarket ECU manufacturers that are viable options such as Mega Squirt family. The issue with this approach to replacing the OEM ECU is that you are your own design engineer, system integration engineer and system tuner.

The throttle position sensor (TPS) is used to determine throttle position and will allow the ECU to operate the engine in the Alpha-N fueling mode. Operation maybe less than optimal, but you will not be stranded. As with all the CFI parts/components, these are old style – designed specifically for the CFI models, and is no longer available. This is one of the components where CFI motorcycle owners have found suitable alternative(s) that can be used to keep the engine operating.

The injectors are quite robust and can be cleaned, flow and leak tested. These are low impedance injectors, approximately 3 OHM or less, requiring the use of an injector pack to limit the current in the individual injector ECU circuits. Aftermarket low impedance injectors of the same design, and impedance can be used. These aftermarket injectors may or may not be the same size of the original injectors, 284 cc/min flow rate at a pressure of 43 PSI. This is important because the fuel system has a static fuel pressure of ~36 PSI and a dynamic – engine operating of approximately 28 to 32 PSI. This pressure reduction reduces the flow rate of the injector during engine operation, but the OEM CFI system is designed for this with the original injectors installed.

The aftermarket injectors I have used have a lesser fuel flow rate. This impacts on the operation of the engine and the fuel injectors. A change in engine performance may not be noticed by the majority of riders, but injector performance may be affected. The ECU control of the engine is based on the OEM design, and as such, the use of aftermarket injectors not of the same size and specifications can affect the engine operation.

A small design consideration regarding the original OEM injectors and aftermarket injectors is the design of the spray tip. The original injector spray tip is quite long. An aftermarket injector that I have used has a shorter spray tip, but the engine operated quite well.

There are two spark units (coil drivers) that cannot be fault diagnosed. These units degrade over time, and I have found no information on a suitable alternative should one or both of these units fail. I have not included a search for a suitable alternative as one of my CFI system projects. This is different from the number of coils drivers that can be used with an aftermarket ECU.

The OEM coils are 3 OHM coils and last a long time. There are aftermarket coils that can be used, but the mounting of these aftermarket coils can be challenging.

The coil wires, spark plug caps and spark plugs need to be considered as well. The OEM coil wires are generally steel core that create a lot of RF noise. The spark plug caps are resistor caps and have a 5K ohm resistor. The resistor spark plugs have a 5K OHM rating. Modern fuel injected system generally use suppression style coil wires and resistor type spark plugs. Modern use of resistor spark plug caps is generally a motorcycle issue. Transitioning to suppression style coil wires, non-resistor spark plug caps and resistor spark plugs is an option to have better engine cylinder spark, ergo better engine operation.

Temperature sensors, air and coolant, need to be checked and confirmed operating correctly. These sensors are used to determine fuel requirements for start up and engine operation at

normal operating temperature. These sensors affect after start fuel enrichment, warm up enrichment and other aspects of engine operation.

The engine crank sensor (Ns) can be checked for correct resistance, but if this sensor fails the engine will not start.

The cam sensor(s), GR/GL, can be checked for resistance as well. If one cam sensor is faulty or fails, the engine will continue to operate as per normal. If both sensors are faulty or fail, the engine will not start.

Manifold air pressure (PB) sensors are used to determine the fueling requirements for the Speed density (SD) operation. If one PB sensor is faulty or fails the engine will operate as per normal. If both PB sensors are faulty or fail, the engine operates at reduced performance in a limp home mode.

Idle air control (IAC) circuit is a passive system the directs air past the throttle plates to allow for better cylinder combustion on start, and during times of deceleration when the throttle is closed. It uses reed valves that are actuated by cylinder vacuum. These reed valves draw air from the IAC system, and discharge the air into the appropriate cylinder at the appropriate time. If this system is faulty or fails, the engine operation at idle and deceleration will be erratic. The engine will be starved for combustion air.

The fuel system is not monitored by the ECU, but is an integral part of the CFI system.

A “tight” fuel system, in that the fuel in the fuel system does not drain back to the fuel tank or leak through the injector(s) to the air inlet chamber and on to the engine cylinder(s) is paramount to the success of the CFI system. The only measure of this is to check the fuel system pressure.

I mention fuel system pressure because the fuel system pressure indicates how “tight” the system is.

Air in the fuel system is not your friend. Air must be purged from the system either through the injector(s) or the fuel pressure regulating (FPR) valve. Air is compressible, fuel is not. This fact affects the injector(s) and the FPR valve.

The fuel system is primed when the ignition key is turned to the ON position. This is for approximately 3-4 seconds. If the fuel system is full of fuel, void of air, this is sufficient for a good engine start, no air to purge.

If there is air in the system, owners have been known to cycle the fuel pump prime to get a better start. Doing this is treating the symptoms and not correcting the root cause. This fuel pump cycling by owners is generally done because the engine will start, the ECU attempts to have the engine idle at the appropriate RPM, but the engine does not have sufficient fuel at start to do this. With a bit of throttle assist, the engine comes up to speed, air is purged from the system and the engine operates as it should.

The issue with this scenario is that during this time of low RPM, the ECU adds more fuel than is required to get the engine RPM to where it should be. This results in excessive fuel smell from the exhaust, that the engine is operating in a RICH condition and the spark plugs may foul from operating in a fuel RICH situation.

Once the engine is operating as intended, the ECU reduces the fuel requirement, the engine RPM settles out to what it should be, and all should be good. The issue now becomes the need to go for a ride, and burn off the excessive carbon that has partially fouled the spark plugs. Once this is done, fuel economy will improve to a normal state, the exhaust smell will be gone, and you the owner/rider will not smell like a 2-stroke snowmobile on cold start.

TROUBLESHOOTING/MAINTENANCE ISSUES

I submit that troubleshooting, or testing for possible engine operating issues that occur with the early Honda Gold Wing CFI models is easier than the carburetor models. The ECU diagnostic checks are very exacting and accurate. If there are no error code(s) indicated, the CFI system will operate as designed, and you should be looking at other possibilities. Having an engine issue and second guessing the ECU diagnostics is a good way to spend money for no reason.

The CFI system on these older Gold Wings is no different than the fuel injected cars of today. An owner does not go looking for ways to spend money just because something is a perceived issue. I equate and submit that the older fuel injected Gold Wings are the same as an older Honda Civic, but on two wheels. The CFI parts/components are the same, but design specific.

Electronic error code(s) can be an elusive, hit and miss target that can be intermittent, much like modern vehicles. If this occurs, you need to determine what the fault is by reading the ECU error code, then test the part/component to determine if it is good, or faulty. You may need to do a wiring check as well.

If the CFI part/component and associated wiring passes the troubleshooting/testing as described in the Supplement, accept this as fact. If the error code continues to plague the ECU system and engine operation, a replacement part/component is probably the best option.

Whenever troubleshooting the CFI system, always use new spark plugs, or plugs that have been cleaned. Using the spark plugs that you have in the engine may give a false impression of the issue being investigated.

The TPS is another misunderstood component of the CFI system. The TPS gets a bad rap whenever there is a fueling issue. The TPS is not part of the fueling equation when it comes to Speed Density (SD) mapping on start, the manifold absolute pressure (MAP) sensor is, other than the ECU knows the throttle position. The TPS is a deciding factor in the higher RPM range when the engine fuel mapping transitions to an Alpha-N fuelling.

I have found the MAP sensor(s) signal to the ECU changes in accordance with the engine vacuum but goes steady state after reaching approximately 2500 RPM and then become a steady state indicator for the ECU engine operation.

Having mentioned this information regarding the TPS, as long as it is calibrated in accordance with the OEM specification, and when operated through the closed/open throttle the voltage indication is smooth, all should be good. It is now time to look elsewhere for the issue.

The MAP sensors (PBR/PBL) are linear sensors and operate quite well. These are monitored by the ECU for correct operation and if faulty will cause the ECU to generate an error code. Again, no error code – should be no issue.

Air/Coolant temperature sensors are monitored by the ECU. These directly affect fuelling requirements during engine operation. If there is no error code generated, but you want to determine the health of these two sensors, remove the coolant sensor from the engine, air inlet temperature sensor for the air box lid, and test. This will be a peace of mind issue, but you will have crossed off another potential issue.

Injectors can be a factor, especially if the motorcycle has been off road for a long time. Injectors get dirty, clog up, and leak if not in service. If this is the case, have the injectors cleaned, and flow/leak tested. These OEM injectors are quite robust as I have mentioned and will generally clean up well and meet original OEM specifications for flow/leak specifications.

The time to do the testing/checking of the CFI parts/components is when you purchase one of these older Gold Wing CFI models. You need to determine the condition of the CFI system parts/components to give yourself a base line from which to work from.

This is much the same as changing the timing belts and/ renewing the timing belt idlers, it's a peace of mind and base line maintenance issue.

The fuel system. Check the fuel pump flow rate, check the FPR valve for correct operation. Make sure the fuel system fuel does not leak back to the fuel tank, if it does, isolate the problem and correct it sooner than later.

The OEM fuel pump does have a small non-return type pintle in the fuel pump discharge, but this can become worn/etched over time and not effective. If this is the case, install a non-return valve between the fuel pump and fuel filter. I do not recommend using the inexpensive variety that you find on Amazon and eBay – may or may not work – BTDT. A good quality non-return valve such as one from Edelbrock/Russel is a good alternative. Installation of these parts can be a challenge, but the upside is continued good operation of the fuel system. As long as the fuel pump delivers the correct fuel amount and pressure, it needs not be replaced. If the fuel pump leaks fuel back to the tank, installing a non-return valve in the fuel line is a good inexpensive option. The issue is to reduce/eliminate any possibility of air entering the fuel system.

The fuel pump is capable of delivering up to 65 PSI, after which if it is dead headed, an internal pressure relief valve recirculates the fuel internal of the pump. There is a number of aftermarket fuel pumps that can be used as long as these are rated for external fuel tank usage, and fit where then OEM fuel pump is mounted. When looking for an aftermarket fuel pump to use, determine if it has an integral non-return valve or not. This will determine for you if a non-return valve in

the fuel line is required or not. If the fuel pump in question does have an integral non-return valve, there is no guarantee that it will work or be working after installed for a period of time, back to an in line non-return valve.

If you decide to upgrade the fuel system to include a smaller, equally capable fuel filter, installation of a fuel non-return valve, or use the newer "AN" fitting, you will have to change out the OEM fuel pump. The fuel pump output banjo fitting is specifically designed to work with the OEM fuel pump. It is not a standard fuel banjo fitting where the opening that fits over the fuel pump outlet is ~12 mm. The OEM fuel pump outlet banjo fitting has a 12 mm and 15 mm opening because of the fuel flow on discharge. The fuel flow discharge is not conducive to using the standard fuel pump discharge banjo fittings. The OEM fuel pump outlet banjo fitting can be made to work with an aftermarket fuel pump.

Using the newer "AN" style fitting will be a challenge because of the size of these fittings. There are a lot of "AN" fitting options to achieve the aim, just be aware that it may not be a quick install.

The fuel pressure relief (FPR) valve can be checked. Lots of videos on YouTube regarding testing these components and the fuel system. Basic component, maintains fuel system pressure over the engine operating range. There are alternative(s) in the 3-bar range, but the issue is the orientation of the FPR valve fuel return connection. This connection may or may not be oriented to use the OEM installed fuel return hose.

EPILOGUE

Having a basic understanding of the CFI system parts/components and the operation of this system is, in my opinion, a key element in owning one of the older Gold Wing CFI models. You may or may not want to do the "wrenching", but finding a person to work on these is getting more difficult to find.

You have to be your own diagnostician. Being able to ask the right questions with the appropriate amount of detail is key to getting the correct answer to your query.

Do not get caught up in the carburetor/fuel injection issue. You cannot correlate these two very different platforms to get to a satisfactory conclusion on a fuel injection issue.

I enjoy working on my '85 Honda Gold Wing GL1200 Limited Edition fuel injected model. I have owned a '95 GL1500 and 2008 GL1800, but prefer the 1200. I prefer fuel injection to carburetors, and find that it easier to work on the 1200 systems.

Most of what I have mentioned in this article is based on extensive research, working/maintaining the CFI system, and from what I have learned by embarking on the OEM ECU Replacement/Upgrade project.

There is a lot of information out there I the various forums, and on through the internet. Most articles on the internet about fuel injection, and fuel injection conversions/modernization is based on the automotive world, but the principles still apply.

This article is probably not all encompassing, and some of the information may not be spot on; however, it is my understanding of the system. I will learn more and may very well have to make corrections to what I have wrote, but that comes with time, learning and experience.

Regards – Safe Riding

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