Decided to type out the information about Honda's CFI system from the Motorcycle Fuel Injection Handbook by Adam Wade. It's a very complimentary article and a good read.

"Saved Honda for the last in the Japanese manufacturer's section, and for a reason. Not only did they start the turbo wars in 1982 with the release of the CX500 Turbo, they also created with it a technical tour de force. In many ways, this motorcycle (and its spawn, the 1983 CX650 Turbo) proved to the world that Honda was a step and a half ahead of anyone else. At a time when BMW was still building air cooled boxer motors fed by carburetors, when Ducati had only two-valve air-cooled carburetor twins, Honda released a bike that was better developed, more technologically advance, and a showcase for its engineering abilities. Beyond all the other technological innovations (such as being the first water-cooled sport machine), it had injection technology that is quite similar in operation to many of today's commonly-used motorcycle EFI systems. As with Suzuki, this system was manufactured by Nippondenso and became the basis for the Denso EFI systems seen on today' Yamaha and Suzukis, as well as Honda's own PGM-FI.

Honda's C.F.I. (computerized fuel injection) was the first production motorcycle system to use sequential fuel injection (which it actually needed for smooth idle, being a V-twin). It was therefore the first to use a cam position sensor (not strictly necessary for sequential operation, but by far the easiest way to handle things). It had a cast alloy intake manifold (provided by Keihin) that featured integral throttle bodies and fuel rail. It had complex chambering in the intake system to reduce intake noise, and it was the first bike to use a resonance chamber in the intake tube (used to prevent turbo surge based on intake resonance, a similar principle to airbox resonance tuning). Like its contemporaries, it had both fuel pump and the fuel filter outside the fuel tank, and also had a petcock (as you would find on a carbureted engine, but for the fuel rail fitting). Unlike any other system at the time, it used an idle air bypass system to raise idle for cold starting, and this was automatic. A valve to allow air bypass and enrichment was attached to a bimetal strip (like that found in a home thermostat), which mechanically opened and closed a bypass passage (enrichment during this time was built into the cold-start mapping of the CT sensor). The ignition system (from Hitachi) was separate from the injection electronics, but used a MAP sensor like the Suzuki to retard timing at higher boost levels.

An interesting note is that this EFI system takes engine speed signals from the cam sensor alone. Two pickups allowed the system to calculate crank angle to properly time injector events for both cylinders. The crank sensor was only used for the ignition system, and no signal was transmitted from the coil primaries or igniter to the ECU. In this, it had something in common with the early Ducatis.

Like with many of today's motorcycles, The ECU ran using a speed-density mapping at small throttle openings, and an alpha-n mapping at larger throttle openings, so it had a TPS as well as a MAP sensor and a TIP (throttle inlet pressure) sensor measuring surge tank pressure (post-turbo). It also incorporated an AAP sensor in the intake for good measure. The acceleration enrichment on this bike was done with a separate map based off delta alpha, and it actually added and additional, separate injection event for acceleration fueling.

Honda even specifies using this feature in their diagnostic injector testing. With the key on and engine not running, a rapid opening of the throttle actually triggers an injection event, and you are instructed to listen for the sound of the injectors cycling to confirm proper injector operation!

Whenever possible, Honda implemented a limp-home mode for sensor failure. This would ignore missing or questionable sensor inputs, and would substitute a standardized value that would allow the motorcycle to continue running in many cases, although at reduced efficiency. Limp-home capability was built into the ECU for faults with the IAT sensor, the CT sensor, all three pressure sensors (the fourth was for ignition retard alone), either of the two cam position sensors, and the TPS. This meant the bike kept running in nearly any possible condition short of multiple severe electrical failures. The ECU also had a series of LEDs to indicate the source of a trouble code. It was also the first production motorcycle to be equipped with a tipover switch that would kill the fuel pump and stop the motor in the event of a drop or crash.

Honda did themselves one better in 1983, modifying the upgraded CX650 motor for better turbo charged performance and both developing and simplifying the injection system. The 650 benefitted from larger valves, more intake valve lift, and higher compression (with a corresponding decrease in maximum boost), all of which allowed for a smoother transition when the turbo was kicked in and stronger running throughout the rev range. The turbo itself was revamped with a larger compressor wheel, and the resonance chamber was removed from the surge tank. The cold start idle air bypass was removed.

But the big changes were in the black box in the tail. In fact, the CX650 Turbo system was the basis for the Honda PGM-FI system, which is still used today. First, ignition was handled from inside the ECU. This was the first production motorcycle with a rue engine management system (by comparison, the high-tech BMW K-bike would have to wait until the 1990 K1 to integrate ignition and fueling) Since ignition was integrated, there was no longer a reason to have a separate boost sensor for the ignition system alone, and it was deleted. Also removed was the AAP sensor located in the inlet pipe; a reading of ambient air pressure was taken before starting the bike (which could necessitate the need to shut off and restart the bike after large changes in altitude). With a TIP (surge tank) sensor and a MPA sensor, as well as a TPS, it was quite possible to easily and accurately compute the air mass entering the engine, on boost or off. To assist in preventing detonation in the engine, ignition timing factored coolant temperature into the mix (another production first, and used again in future systems). In fact, ignition timing was now done by two overlaid 2D maps, one for alpha-n and one for MAP-n, which allowed a more complex method of mapping timing based on boost pressure than was available on the 500, in addition to allowing more advance at part throttle. And last, there was now also a crank position sensor for thee EFI. Thanks to this addition, Honda was able now to run both ignition and injection with any one of the three engine speed/position sensors inoperable. Previously, if the crank sensor had malfunctioned, there would be no spark.

Sadly, after completing this technical masterpiece and being king of the motorcycle playground hill, Honda took its ball and went home. Fuel Injection would not appear on another Honda badged motorcycle until 1998."

This is a good article with one major issue, he missed the 1985/1986 Honda Gold Wing FI models.

Honda reintroduced the AAP sensor in the ECU. The use of two cam sensors for wasted spark ignition. Honda did change a couple of the limp-home modes, otherwise much the same.

Don’t shoot the messenger if there are subtle discrepancies, but the realization is that the CFI system was well ahead of its time.