

Capacitor Kawa

AECS

AUTOMOTIVE EQUIPMENT & TRAINING
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Kawasaki KLF400 (picture source internet)

This article is a true description of an AECS technical help desk problem and how it was solved.

Vehicle

Kawasaki KLF400 ATV

AECS

Problem presented to the Technical Support Team

This hardly used farm bike intermittently does not want to start. It has been to a number of motor-bike workshops and it pretty much has been parked up for a few years now. We are thinking about throwing it away as it just takes up space in the workshop. Is team AECS interested in looking at it over the holidays. "No, we are not", was our stern answer, as it has been a very hectic and tumultuous 2021, we can do with a break. So, the bike appeared one morning as a gift. We could not turn it back now, could we.

Where do you start

When jumpstarting we noticed that there was plenty compression, so likely no mechanical problems on this truly low k bike.

Whip the spark plug out and found that to be dry, like the tank. After filling up the tank, the spark plug remained dry. No flow from the carburetor drain screw.

Removed the carby and found the bowl full of black tar. Went all out to clean all jets and channels. Only to discover no flow from the tank tap. Cleaned black tar out from the tank and tap, to now finally have flow from the drain screw.

For those that are younger amongst us, a carburetor is some sort of fuel injection device...lol.

Wet

Winding over the engine still gave us no running engine, this time the sparkplug did get wet though!

Winding over with the sparkplug out did show spark though! Maybe a mixture problem?

Sparkplug back into the head and Presto the engine ran! It actually ran quite well without changing the mixture. It definitely crossed my mind that we had a good, cheap and easy gained bike.

Lucky?

However, I have never been lucky with things like this. Sure enough he next morning no firing up of the bike, wet spark plug and this time no spark when winding over with the plug outside the combustion chamber.

Measure

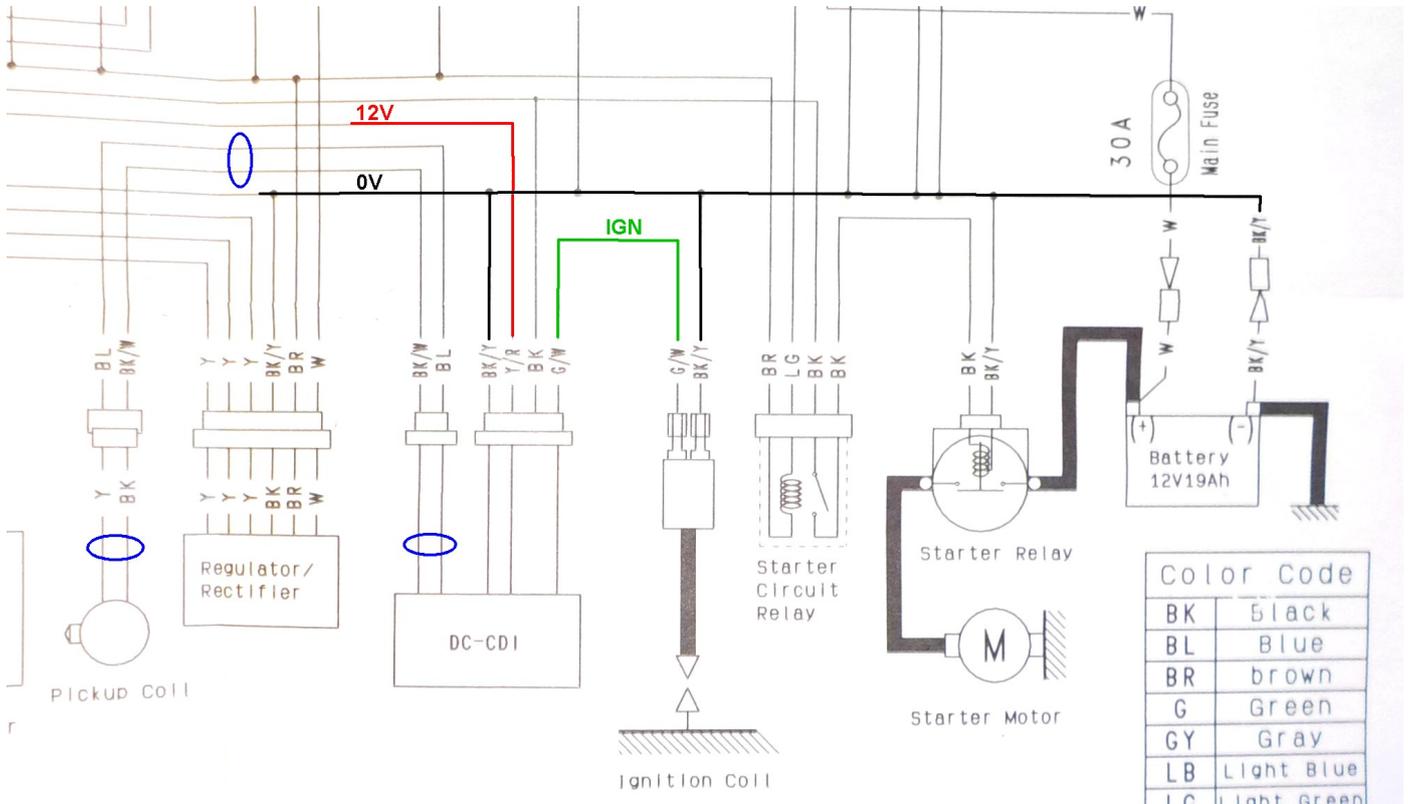
Time to measure with the scope and better nail down where the problem is before the spark returns.

The bike came with an owners manual which contains the appropriate wiring diagram, which makes it easier to diagnose.

Many small bikes (dirt and farm bikes) have an ignition system called CDI (Capacitor Discharge Ignition). I do not deal with CDI systems very often as through AECS tech support we deal more with EFI systems, where ignition coils are switched to earth by the ECU or an ignitor. A CDI system works very differently.

Diagram

In the diagram below I have highlighted the wires to and from the CDI unit.

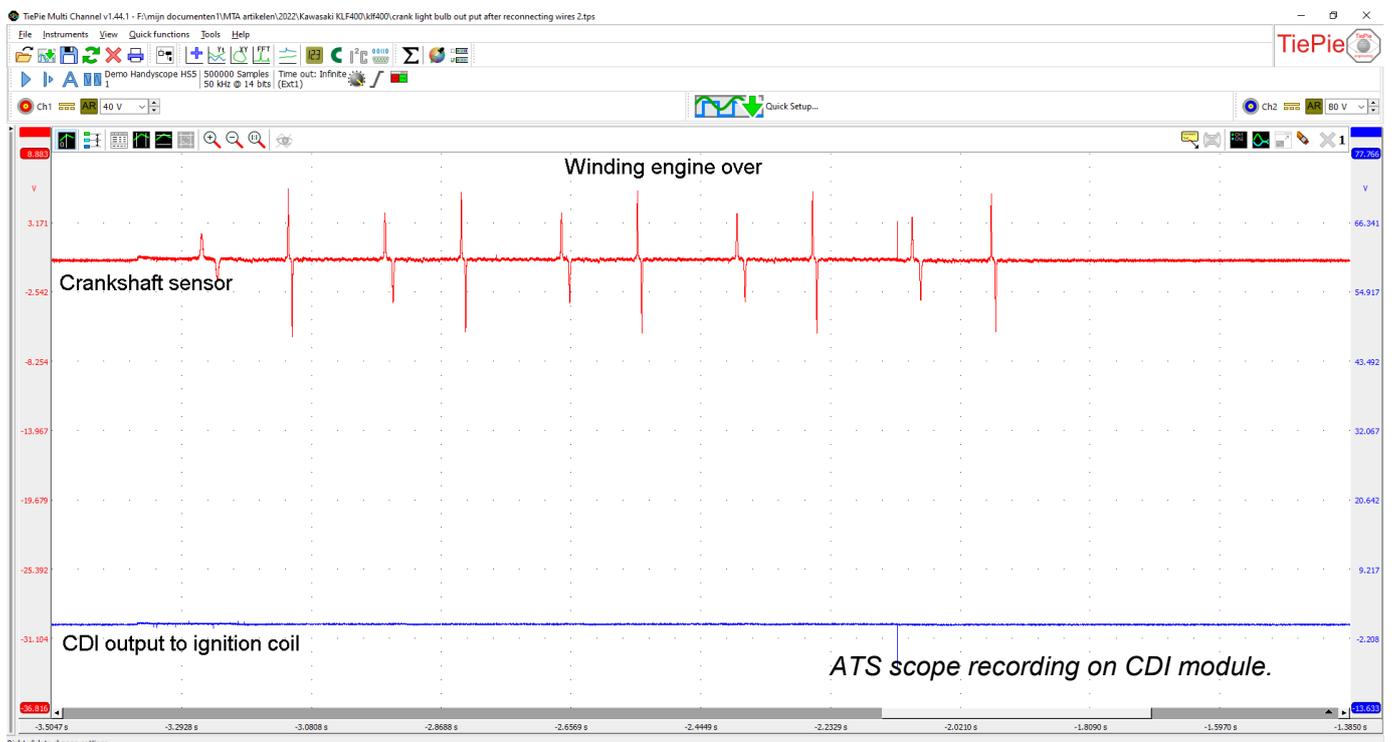


KLF400 diagram

- The red coloured wire is the ignition on power supply to the CDI unit.
- The black coloured wire is the earth wire of the CDI unit and the coil.
- The green coloured wire is the output wire through which the CDI unit discharges its capacitor into the ignition coil, to create the spark.

It is important to note that the ignition coil's primary is connected permanent to earth. The signal the CDI units needs is the signal from the inductive crank shaft sensor (pickup coil).

Scoping the crankshaft signal and the output of the CDI unit showed a nice big flat line at zero Volts, while the crankshaft signal is clearly visible.



To make sure that the module had everything it needs to work, the power supply and earth had to be measured



ATS scope recording of the crank shaft sensor and CDI unit's power supply.

The power supply stayed present, the only fluctuations seen are the voltage drop as a result of the starter motor fighting compression of this single cylinder engine.

Simple!

It is really not that hard isn't it? The CDI unit had a crank signal, earth and power supply. That can only be a crook CDI unit. Just order a new one and presto!

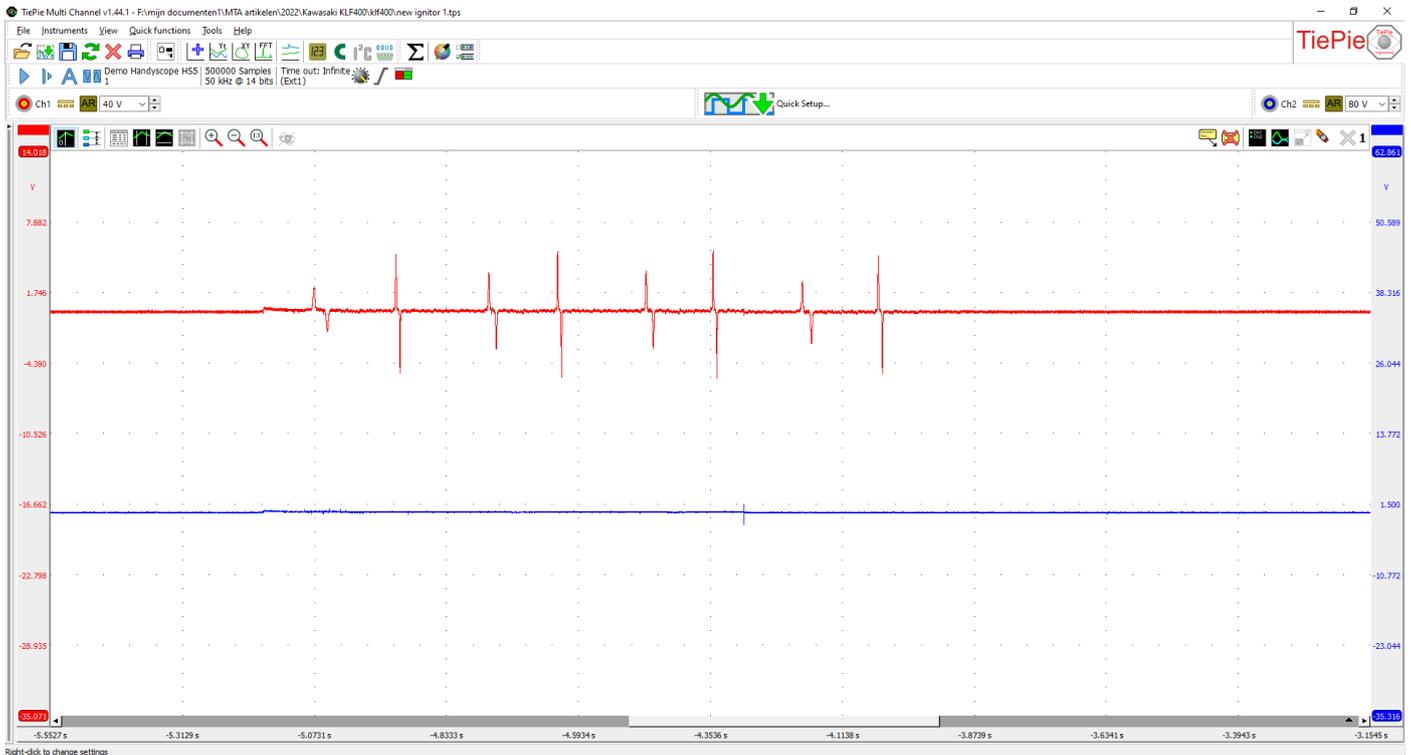
Not so quick... No new and no second hand parts available anymore. That would in all cases spell the end of this otherwise nice bike.

Maybe we can get a unit from a similar bike, like the KLF300, after all the ignition system is likely the same, the ignition system is not really affected by engine size.

After having spend about \$70 on a new KLF300 CDI unit we found that the unit has the same amount of wires (5x) but only a different plug (3 pin instead of 4 pin with one unused position).

Easy, just take the 3pin plug apart and put the pins of the new CDI into the old plug.

Plug the unit in and NO GO!



The output of the new CDI unit.

Mr Google

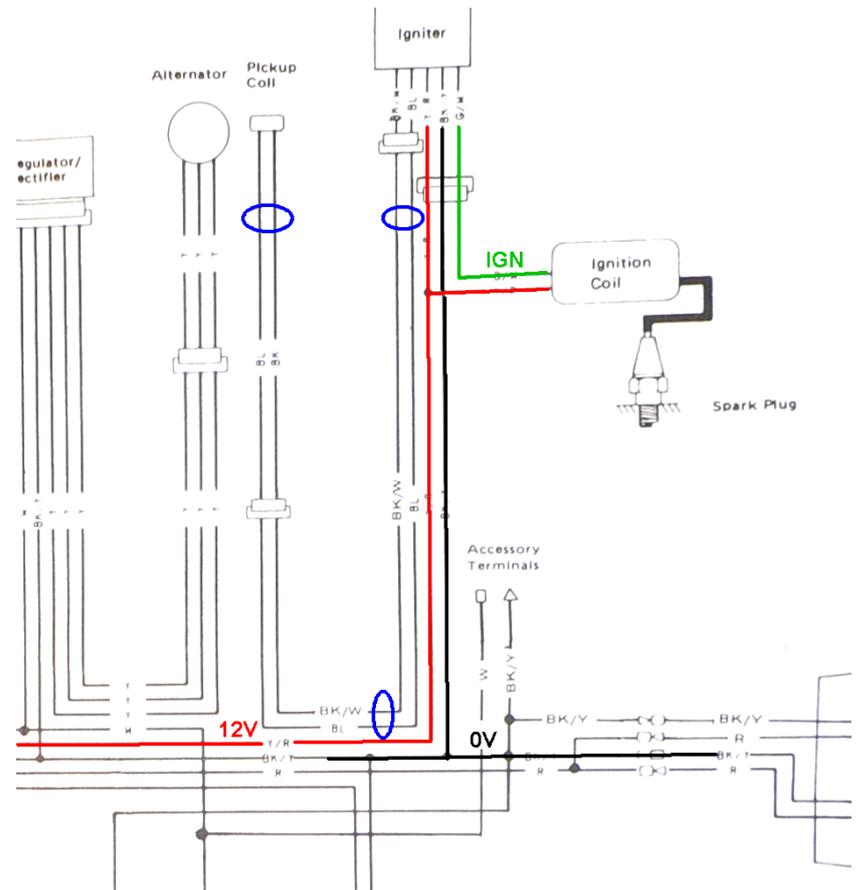
Better have a look at the wiring diagrams of the KLF300 and see if there are differences. The amount of different wiring diagrams that came up are unbelievable. Many exactly the same as the KLF400, and some very different. As usual, a big waste of time to try to find the answer on Google.

I happened to know someone with a KLF300 whom still had the owner's manual for that bike.

Below is a picture of that diagram, and instantly visible are two major differences:

- 1) The coil in the KLF400 is connected to earth and the ignitor, The coil of the KLF300 is connected to 12V and the ignitor.
- 2) The CDI unit in the KLF400 is called DC-CDI, The 'CDI' unit in the KLF300 diagram is called igniter.

Please look at the diagram section where I have highlighted the main connections in red, black and green.

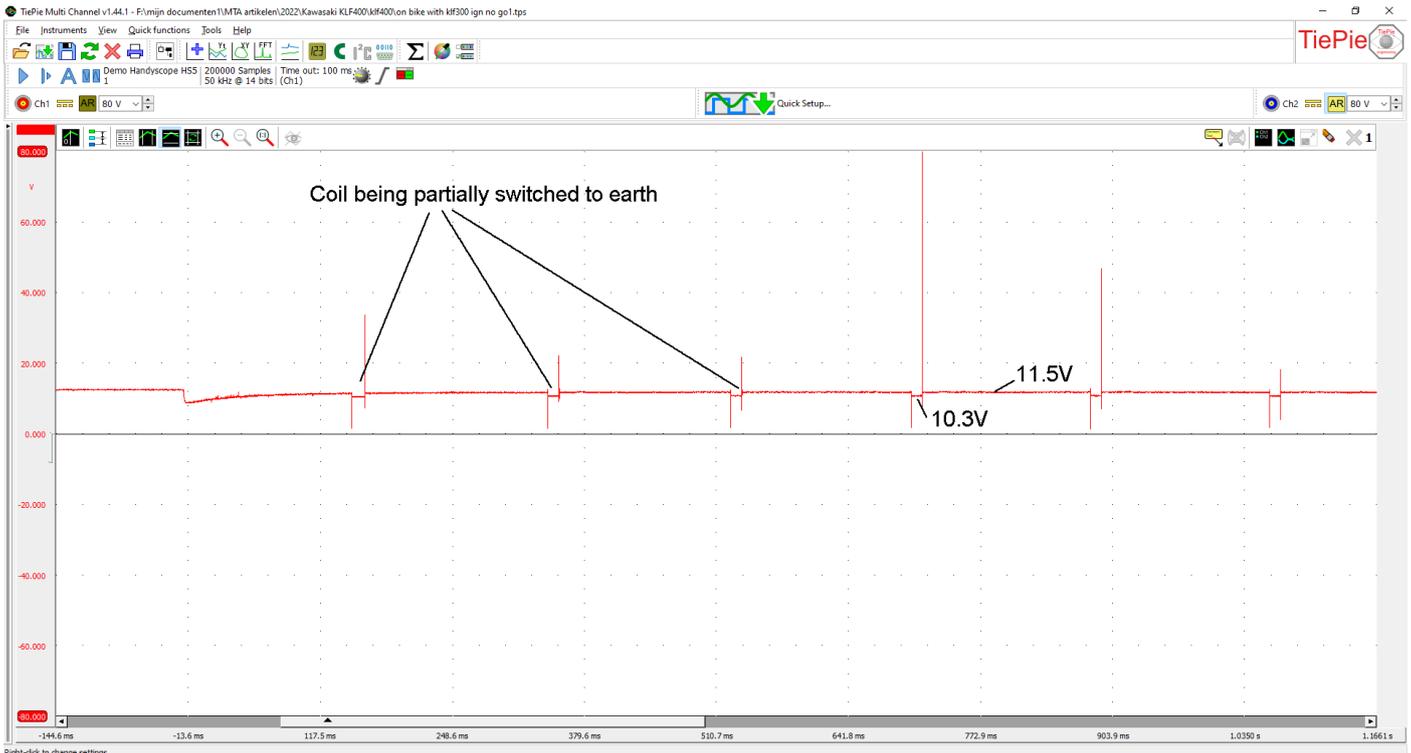


KLF300 diagram. The size of the diagrams is too big to fully print.

Too easy!

This was going to be an easy solution, simply connect 12v to the ignition coil positive and the thing should finally go! NOT. Still no go.

No spark, but some signal of a weak spark on the scope:



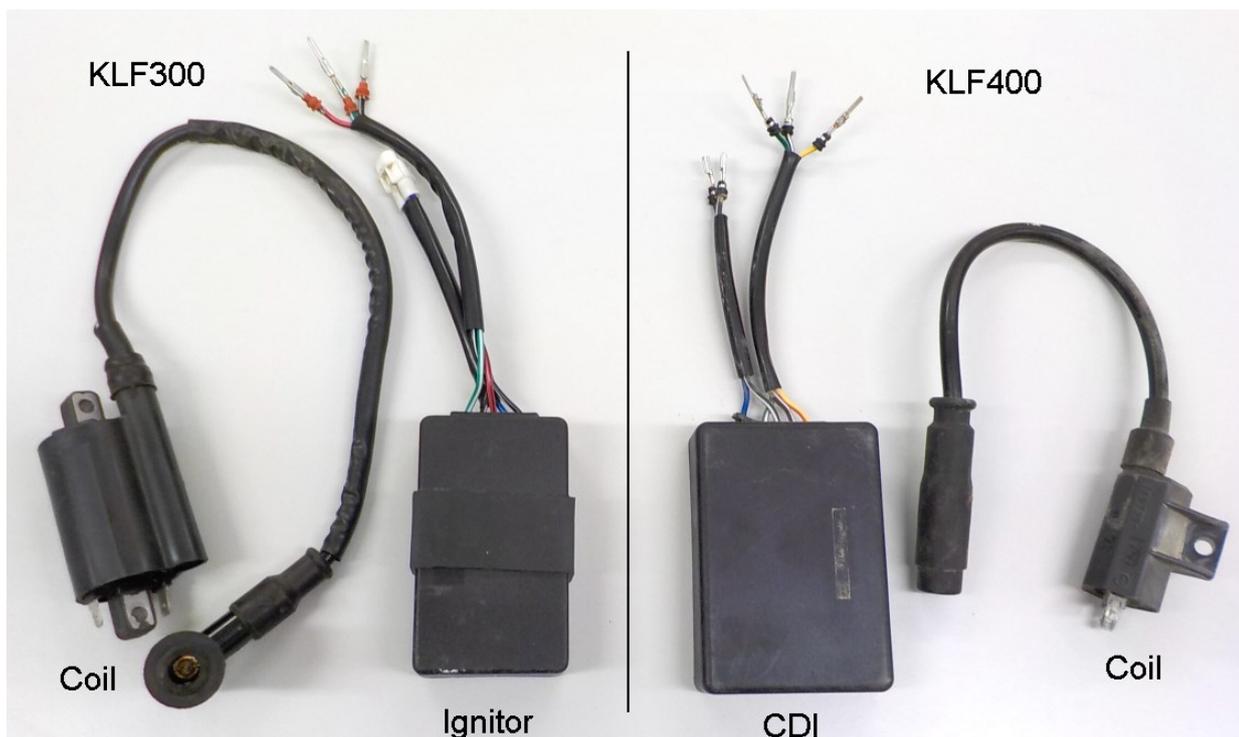
ATS scope recording KLF300 Ignitor output

When zoomed in on the release of the coil there was actually no spark, just some oscillations. When you look at the voltage where the ignitor tries to switch the coil to ground you can see that the voltage only is being pulled down to 10.3V. I expected a value close to 0Volt.

Back to the drawing board

After having done some testing of the CDI unit on the bench, which decided to work again for a short period of time, I saw that the coil of the KLF400 was producing perfect sparks, yet when connected to 12V and the KLF300 ignitor it did not, because the new ignitor was not able to properly switch the coil to earth.

A quick trip to the actual KLF300 bike revealed that the size of the coil was very different.



Both ignition systems on the workbench side by side. Pls note the size differences.

Bingo!

After fitting the KLF300 Coil the bike started and ran fine:



ATS 500XM scope recording with the engine finally running.

A quick resistance test showed that the CDI primary coil had a resistance of 0.2 Ohm and the KLF300 coil was 1.7 Ohm.

The resistance of the CDI primary coil was simply too low to be able to be switched to earth by the ignitor. There is a maximum of current that can be switched by the poor little ignitor!

Conclusion

All in all I do not know if the holiday job was worth it, as in the end a fair bit of time was burned up in this bike. However it is a perfect runner and might be handy for someone one day.

How lovely that the ignitor was sold as a KLF300 'CDI' unit! There is no way of telling from the outside and certainly not without the ATS500XM scope recordings that it was NOT a CDI unit.

I hope that this information is helpful for someone as there are plenty of these bikes for sale for parts only (without CDI units).

Think outside the square and just make it work! Your work is not that hard.

Thank you!

Herbert Leijen
Director **AECS** Ltd

Work Smarter and Harder



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- Piercing probes
- Hirschman probes
- 100x coil BNC
- 100x coil 4mm
- Solenoid driver
- Pressure sensor
- Milliohm meter



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Vacancy:

Automotive engineer

AECS is looking to employ an engineer to fulfil our need to supply the best possible service to our customers. The person will need to have experience in the automotive and or truck industry with preference given to those with automotive electronic or diagnostic experience.

We have found that the job is perfectly suited to Automotive, Mechanical or Electronic engineers. If you feel that you are not up to that level yet, let us help you getting there!

Computer/device literacy is also important as the position requires the use of computers to communicate, follow and document procedures, analyse automotive scope/scantool recordings.

This position will require travel throughout NZ for onsite training, sales and service to suit our customers' automotive equipment and training needs.

The successful applicant will predominantly be based in our office/research center close to Hastings in Hawkes Bay.

An excellent level of technical communication skills (with foreign and local companies) are required.

AECS can offer the applicant the latest and highest level of training on electronic diagnostics. We have an interesting and varied work environment with the chance to develop your career into a number of fields within the company, for example; training, equipment sales, technical support, advertising, etc.

We will take you to the highest level that you are comfortable with!

If you are a team player, are meticulous, can work unsupervised, be a little flexible with your work hours to fit with our customer's needs, want to be at the top of the automotive industry in NZ. Then please send in your CV by E-mail to jobs@aeecs.net before 15 March 2022

I promise that I treat your application with confidentiality.

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