Rex's Capacitor Discharge Ignition Fault Finding Guide

CDI systems are extremely reliable but operate very differently from conventional 'electronic' ignitions. When they go wrong, they can develop frustrating faults that shop manuals rarely explain properly—if they mention them at all. This guide cuts through the confusion, built on years of hands-on electronics design work and thousands of real-world repairs, it lays out the most common issues and provides a no-nonsense approach to diagnosing and fixing faults fast. Our technicians are proud to be your trusted go-to experts when advice is needed on unfamiliar electronic systems.

Overview of Capacitor Discharge Ignition (Self Generating)

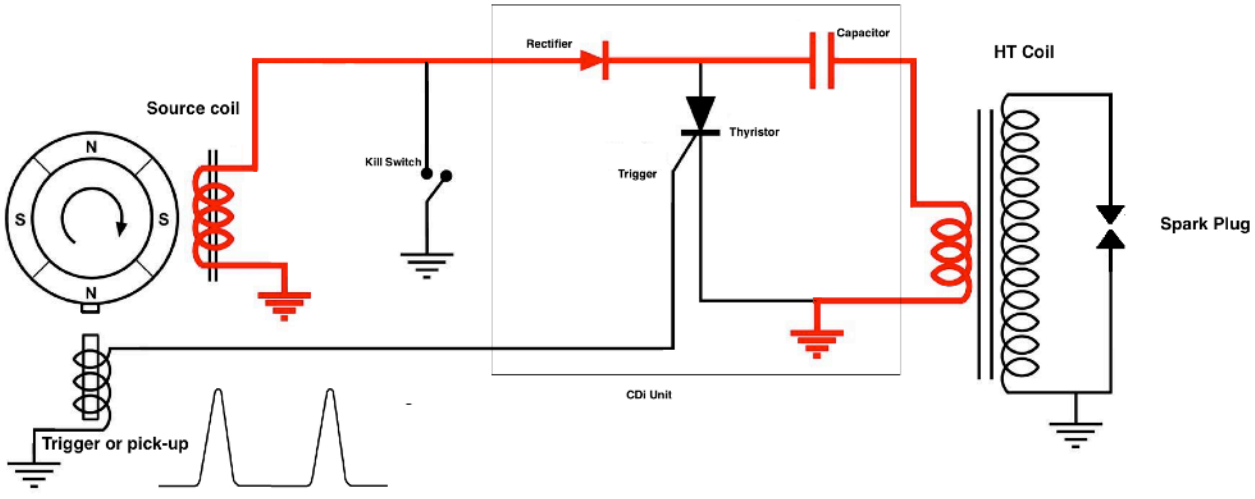
Self-generating CDi ignitions consist of several key components: source and trigger windings on a stator, a crankshaft-mounted magnetic rotor (flywheel), CDi unit, HT coil, spark plug and of course a means to stop the engine, referred to as the kill circuit. The power for the sparks is generated in the source winding by magnets mounted the flywheel. As the crankshaft rotates so the source winding produces AC voltage, just as an alternator does. However the output reaches around 200 volts, which is sent directly to the CDi unit. This voltage is rectified inside the CDi unit to charge a large capacitor. The effect of the rectifier inside the CDi also increases the voltage further.

A second, smaller winding within the generator works with a precisely positioned magnetic button on the flywheel—or a reluctor on the crankshaft—to trigger the release of stored energy from the capacitor. This results in a sudden, high-energy surge sent to the ignition coil.

The ignition coil (HT coil) is a specialised step-up transformer that amplifies this voltage until it's strong enough to ionise the air in the spark plug gap, creating a spark to ignite the fuel. CDI systems generate an incredibly fast spark—quicker than battery-and-coil or even magneto ignitions—offering a key advantage: In two-stroke engines, there's a critical moment when the oily air-fuel mixture can coat the spark plug tip, potentially shorting the spark to ground. CDI prevents this by delivering the spark before this point in the cycle, reducing plug fouling. This makes CDI the top choice for reliability, followed by magneto ignitions, which are also resilient to plug fouling.

Beyond reliability, CDI systems have another major advantage: their electronics can be tuned for specific ignition timing curves, optimising power delivery. In contrast, points-based magnetos have fixed timing, resulting in a much narrower power band found on classic high powered motorcycles.

CDi systems are not 6 or 12 volts and the self generating type operate independently of the motorcycle's charging system at around 200-300 volts. It must be noted that CDi is never 'live' when the engine is stationary and must never be connected to the vehicle's battery. Instant failure of the CDi unit will result if it, or an HT ignition coil connected to the CDi unit is supplied with battery voltage.



Key Troubleshooting Principles

1. Start simple. Define the issue and follow the shop manual's basic troubleshooting steps.
2. CDi units cannot be tested without specialist equipment, but valuable information can be gathered from the rest of the system with a multimeter.
3. Shop manuals may provide misleading expectations with very unrealistic tolerances for winding resistances. We give you the knowledge to obtain more accurate results when assessing resistance readings.
4. Avoid improvised tests. Many unverified methods expose the user to dangerous voltages and yield unreliable results.
5. Crank the engine normally, as if starting by using the kick-start, electric starter, or for race bikes, rollers that aggressively spin up the engine. Alternative methods such as electric drills often fail to generate sufficient acceleration for proper ignition function.
6. If unsure, seek help. Someone experienced with a multimeter can save time and prevent inaccurate test data being recorded.
7. Electrical components deteriorate over time, even if they're not in use. The time since manufacture is a key indicator of how reliable an electrical part is likely to be. We'll explore this further below.
8. Take care with dual-lead HT coils, these must have a path to ground on both HT leads when testing for spark. Any spark gap must never exceed 5mm. Operating without an earth path for both leads can burn out the coil almost immediately.

An error to avoid is that to assume a new part is faulty if the system stops working altogether. Read on to gain valuable information to improve your knowledge when faced with such a situation.

What Common CDi System Failures to Expect

Before reaching for the multimeter, let's first consider common failures and the symptoms they cause. Often, simply observing what happens—along with knowing the system's age—can lead to an accurate diagnosis.

CDI ignition relies on high-voltage generation from engine-mounted windings inside the generator. Since these windings are exposed to engine heat, faults that only appear once the engine is warm often point to an issue within the generator itself.

CDi systems also have timing circuits curves so if the engine has a specific fault only after a certain RPM regardless of engine temperature it maybe the timing circuit is failing, either the sensor that supplies the signal or the electronics inside the CDi unit. First though, eliminate a source coil fault.

Important Symptoms To Note.

- The engine starts cold but is difficult or impossible to start when hot.
- Won't kick-start but will start with an electric starter or bump start.
- Runs but develops a misfire or cuts out, recovering when cool.
- Weak yellow or orange, intermittent, or no spark.
- Engine revs in neutral but struggles under load.
- Misfires at higher RPMs.
- Multi-cylinder engines may fail to fire all cylinders consistently.
- The fault changes or the system stops working altogether with a new CDi unit.

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Most of these faults are common in systems over 10 years old and typically stem from degraded windings or failing capacitors. One of the first checks should be the spark—ideally, it should be blue or blue-white. A weak orange or yellow spark, especially when combined with other symptoms, strongly suggests an ageing system with weakened windings.

CDI ignitions also have unique issues related to their main capacitor in the unit itself. As it ages, its impedance increases, which reduces efficiency and weakens power delivery to the HT coil. The capacitor's insulation, known as the dielectric, can also degrade over time, making it less capable of handling high voltages. While the resin seal helps protect against mechanical stress and cracking, prolonged exposure to harsh conditions can still lead to internal damage.

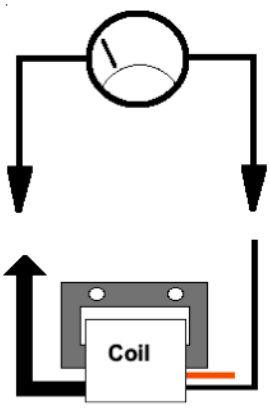
An ageing capacitor, with increased resistance can have an unexpected effect—it can temporarily compensate for weakened windings. However, when a new CDI unit is installed, the fresh capacitor works as it should, it has a lower resistance and allows a higher current flow. If the winding insulation is already weak, the source winding may struggle to meet this demand, causing the system to stop working entirely. This issue is particularly common in systems over 20 years old but can sometimes appear in those as young as 15 years, hence time since manufacture is a yard stick to system condition that cannot be ignored.

Where to Start Looking

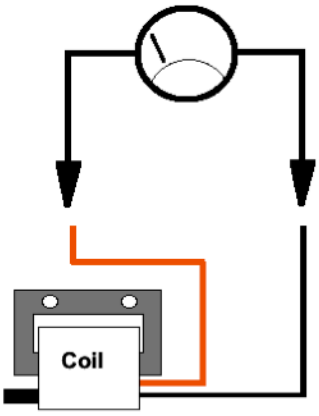
We assume the basics have already been checked—such as replacing the spark plug and cap—and troubleshooting in the shop manual has confirmed an ignition fault. Poor wiring and shoddy connectors must also have been removed from the equation.

If there's no spark, start by isolating the kill circuit. This is a simple way to rule out a faulty ignition or kill switch and any related wiring. If disconnecting the kill circuit doesn't restore the spark, inspect the HT coil for cracks, damaged leads, or poor connections.

Check the HT coil's primary and secondary resistance. The examples below show where to measure resistance:



Secondary
(Kilo Ohms)

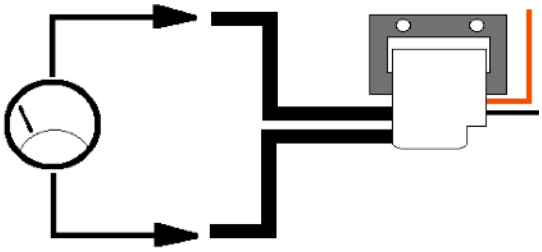


Primary
(Ohms)

The metal frame is the earth if there is only one primary wire

Measuring Twin Lead HT Coils:

The secondary of dual lead coils is check between both HT leads, again with plug caps removed



The primary is exactly the same. The metal frame is the earth if there is only one primary wire

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The next stage involves deeper checks using a multimeter. While disassembling the generator isn't necessary at first, it's wise to have the correct tools ready. An air-powered impact driver (sometimes called a rattle gun) and the proper extractor are essential. The impact driver delivers a shock to the extractor, easily breaking the taper's hold. Tools without this shock effect may work but are far less effective. Flywheels, are often pressed steel and are easily damaged by improper removal, making the correct extractor essential not optional.

To measure the winding resistance, disconnect the generator loom—there's no need to remove the generator yet. Use the shop manual's wiring diagram to identify wire colours and their corresponding windings. Use the blank form provided at the end of this document to record your results. This may help to show up a winding that has a slight resistance range variation compared to its neighbours. Temperature is crucial—if the engine has been running, wait a few hours for it to reach ambient temperature before taking resistance measurements. Read on to discover why temperature is so important to improve your troubleshooting accuracy.

Obvious faults include open-circuit windings (no resistance reading), altered values or unstable resistance values. These issues often stem from burned-out magnet wire, either its shorted together (altering resistance) or broken, leading to no, or unsteady readings.

If no obvious faults are found, IE the resistance appears 'within range' check your resistance reading list, is any one reading sitting differently in the range? If so you have found the fault. Remove the flywheel and inspect the source coils for cracks, missing insulation and damage. While manufacturers don't specify a lifespan for windings, experience shows reliability drops significantly after 10-15 years. As a windings age approaches 20 years, insulation failure becomes the primary issue rather than burnt-out magnet wire inside the winding. This type of failure won't show up on a multimeter, hence time since manufacture must be taken in to account. Another clue is a fault that comes on as the engine warms up and disappears when cold, this is just one sure indication of insulation weakness.

Understanding Winding Resistance: Why Shop Manuals Fall Short.
You wouldn't measure the clearance between a piston and bore and then apply a 20% tolerance to it - yet this is exactly what most manufacturers do when it comes to winding resistance. Copper wire changes resistance with temperature, but shop manuals rarely mention this. We suspect the 20% tolerance is intended to account for temperature variation, but in reality, it misleads people into thinking that any reading within this wide range is acceptable.

Windings are precision-made components, so a graph showing exact resistance over a temperature range would be invaluable - yet most manuals provide only broad resistance ranges with no mention of temperature. Occasionally, manufacturers include the original resistance value, which is ideal. Once temperature is accounted for, any deviation from this value signals a developing fault. Resistance is always given at the ISO standard day temperature of 20°C (72°F).

The difference between a good and failing winding can be just a few ohms. By correcting for temperature and applying a tight tolerance - 5% is recommended to account for meter and natural manufacturing variations - you can easily detect changes from the original value.

To consolidate this information; Windings fail in two distinct ways, rarely mentioned in manuals:

1. Magnet wire failure – where internal shorts change resistance, often seen in heavily loaded windings, typically within the first 10 years.
2. Insulation failure – where the wire remains intact, but voltage leaks unpredictably leading to a range of seemingly random faults. This becomes common in systems 20 years or older.

To assess insulation condition, an insulation tester is needed. However, testing can be tricky since many CDI source windings are grounded, posing challenges even for professionals. This is where you should be guided by the symptoms and the age of the components - systems over 20 years old suffer multiple issues from degraded insulation, both in the windings and the CDI unit itself.

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Age of system	**0-10 Years** **Failure of single items, usually the most heavily loaded in the system are most common**	**10-20 Years** **Middle ground, one item failing may damage another, age related faults creeping in.**	**20 Years and over** **System is end of life, replacing one item will put stress on the others leading to further faults occurring.**
Success rate when replacing just one item in the system	**95%**	**50%**	**25% or less**

When you don't have the equipment for in-depth tests, our go to guide above proves invaluable in revealing the most likely problems that will be encountered. Initially, heavily loaded components fail and replacing or repairing just that single item typically yields good results. However, as the system approaches and exceeds 20 years of age, electrical insulation begins to weaken in both electronic components and windings. The only solution at this stage is replacement of electronics with new, and to fully strip down the windings and restore them to original OEM specifications. It should be noted that if you don't have a fault, leave the system alone.

Addressing a worn and aged system - whether mechanical or electrical - by replacing only one part rarely leads to a satisfactory solution, would you fit new piston rings and fail to hone the bore or replace worn bearings? If you did the result would be limited success for a short period, hardly worth the effort.

Our team here at Rex's Speed Shop has, over the years, aided countless customers, ensuring these issues are solved and guided them successfully through the process. It should be noted that to ensure we can offer a highly specialised service, our focus is on a limited range of models, so it is important to check first before sending parts to us. For further assistance, use the form below or contact our small but dedicated team: tech@rexs-speedshop.com.

Make		Year	
Model			

Ambient Temperature: ……..C or F (circle as applicable)

Record both the figures given in the manual and your own readings. Without the shop manual figures our technicians may not be able to assist, particularly at very busy periods.				
Test	Item	Manual figures	Readings observed	Calculated 5% range
2	HT Coil Primary (Ωohms)			
	HT Coil Secondary (ΩK - thousands)			
3	Low speed source Ω			
4	High speed source Ω			
5	Low speed pick-up Ω			
7	High speed pick-up Ω			
8	Other, if applicable:			

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