Rex's Speed Shop

Guide Y-7: CDi Ignition Trouble Shooting

Yamaha DT175 (1978-79) ~ IT125 (1980-81) IT175 (1979-83)
& IT490 (1983-84) USA & Canada Models Using our DT2 CDi

A simple plug-in unit may be all that is required to restore relatively new ignition systems, however older systems are often suffering age related degradation of all their components. The generator is an often overlooked but key component to consider, as it too can cause symptoms such as: no spark, poor starting, misfiring when hot, or a weak yellow spark. It can stop the engine running when hot or cause a failure to run after fitting a new CDI unit.

CDI ignition components, especially the generator windings, are precision parts operating under significant electrical and thermal stress. If a winding's electrical characteristics differ from the original specification, it is a clear indication that the winding is beginning to fail. However, copper resistance changes predictably with temperature, so this important factor must be corrected for. Workshop manuals often quote unrealistic tolerances because they do not account for temperature variation; this guide provides the missing data to make your troubleshooting more accurate. Checking winding resistance with a multimeter is a very valid test and will reveal many faults, however some problems cannot be detected this way.

An often overlooked fact is that a multimeter cannot measure the strength of insulation between closely packed winding wires, or detect if parts of the winding are leaking to earth. The insulation that normally prevents this naturally weakens with age, but because it is difficult to test, the age of the component is often the best guide to its condition. Even if the temperature-corrected winding resistance is exact, the ignition will not operate correctly if the insulation has weakened enough to let the voltage powering or signalling the CDI unit escape randomly. This is why many CDI faults appear random in nature.

It is important to understand that 'working' is very different from 'working to its intended design specification'. If you are dealing with a system that appears to give good test results, yet replacing simple items such as the HT coil or CDI unit has made no difference, or even caused the fault to worsen or stop the engine running altogether, it is time to look more deeply at the symptoms. If the bike is more than 20 years old, the ignition system is already well beyond its intended design life and may require far more than a simple drop-in part to restore correct operation. This guide aims to expand upon and explain some of the information contained in the workshop manual, which should always be used alongside it.

Identify the syster

Two 'windows' in the flywheel

Single lighting coil

Dual source coils, one above the other fitted to the right hand side of pick-up.
Note the pick-up may be in a different position depending on model.

Manufacturer	Mitsubishi	**Test**	**Resistance at 20ºC**
FLYWHEEL (never mix flywheels and stators)	IT490:F3T201 DT175: F3T250	Red ~ Black	13.6Ω*
OEM CDi P/N	IT ~ 2W6-85540-20-00 DT175 ~ 2A7-85540-20	Brown ~ Black	420Ω
REX CDI Unit P/N	DT2	White/red ~ Black	12.4Ω
IGN TIMING	IT ~1.9~2.1mm BTDC DT175 ~1.8mm BTDC	HT Coil PRI / SEC	0.6 ~ 1.5Ω / 4KΩ ~ 8KΩ

*We have noticed that this winding measured at 17.1Ω at 20ºC on IT490 models, not 13.6Ω as stated in the manual. We feel there may a typographical error in the shop manual for some models only.

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A visual inspection of the stator is the first step, you can plainly see mechanical damage, aged or failed wiring and corroded or inappropriate connectors. The wiring at the generator is crucial, voltage and temperature here is high, the CDi source coil outputs around 200 volts. The windings are all being actively coerced by magnets passing them, generating a lot of heat in addition to the engine's. There should be no joins or faults on generator wiring. If no faults are noted and connections are as Yamaha intended, the next step involves measuring resistance of the various CDi windings using a multimeter. Follow the procedures described in the Yamaha workshop manual. We do not repeat those step-by-step procedures here, if you are unfamiliar with using a multimeter, we recommend seeking assistance from someone experienced in electrical testing.

Your Test Results:

Ambient Temperature:……..C or F (please circle which units)

Measure Resistance:	Standard reading @ 20ºC	**Your Readings (un-corrected):**
Low Speed ~ Brown ~ Black	420Ω	
High Speed ~ Red ~ Black	13.6Ω	
Pick-up ~ White/red ~ Black	12.4Ω	
HT Coil PRI / SEC	0.6 ~ 1.5Ω / 4KΩ ~ 8KΩ	

Important: Many manuals suggest accepting a large tolerance of 10% or even 20% on measured coil resistance readings, but this is entirely misleading. CDI windings are precision components, so once corrected for ambient temperature, any difference between the specification and measured value is a clear warning that the coil wire is breaking down internally. There is only a very small allowable tolerance due to copper being highly temperature-sensitive and meters varying slightly in accuracy. Small variations of up to 2% are normal, but once the discrepancy reaches 5% or more, the winding has failed. Any winding that gives no reading, or one that does not remain steady, has also failed.

For example, at 15ºC the low-speed source coil should read 411 ohms. If your reading differs from this, for example 395Ω, you have found a fault that needs attention. It is that precise.

Ambient Temp (ºC)	Low speed (Brown ~ Black)	High speed (Red ~ Black)	Pick-up (White/red ~ Black)
-10	370.50	12.00	10.94
-5	378.75	12.26	11.18
0	387.00	12.53	11.43
5	395.25	12.80	11.67
10	403.50	13.07	11.91
15	411.75	13.33	12.16
20	**420.00**	**13.60**	**12.40**
25	428.25	13.87	12.64
30	436.50	14.13	12.89
35	444.75	14.40	13.13
40	453.00	14.67	13.37

Use this table to correct measured readings for temperature. The engine must be cold.

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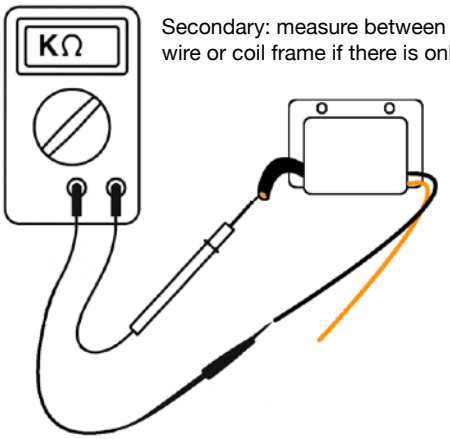
The low-speed source coil is by far the hardest-working coil and the one most likely to fail, but as these bikes age, faults begin appearing throughout the ignition system. If your stator gives perfect, stable resistance readings but the bike still does not run properly, look further for other symptoms. Does the fault worsen when the bike is hot? Is there a mysterious misfire or problems only under load? Is the bike difficult to start, perhaps needing bump starting? Has fitting a new CDI caused it to stop working altogether? New CDI units load the windings to their full design power, charging much faster and to a higher voltage than an old CDI can achieve, which highlights weaknesses in ageing windings. If heat or load triggers problems, this clearly indicates insulation failure that a multimeter test will not detect. If you find off-specification resistances or suspect failing insulation, the cure is to have the generator overhauled back to its 'as new' specification.

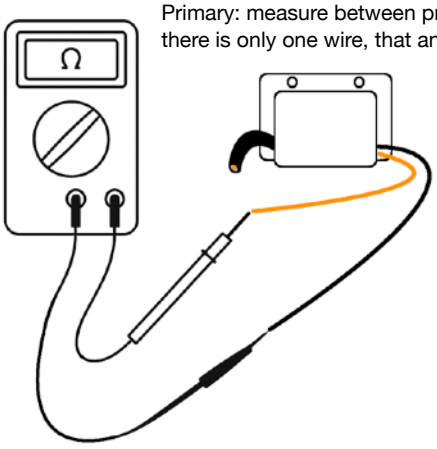
Checking HT Coils

Non original equipment coils often show some variation in resistance to original parts, so sensible readings are what you are looking for. It is more important to get the correct type of coil, IE one for CDi ignition and not one for battery & contact breaker ignition, etc. When measuring the HT coil, always remove the HT Cap. As an example, if you are expecting to see a reading of 7K ohms and you get a reading of 8.5K, this is not necessarily a reason for concern. However no reading or one that is not steady shows an obvious fault. Resistance that is extremely high or low should be examined further.



Secondary: measure between HT lead and earth wire or coil frame if there is only one primary wire.

Primary: measure between primary wires or if there is only one wire, that and the coil frame.



Setting Ignition Timing

Ignition timing for these models is described in terms of static timing, using a DTI to set the piston position. To assist production-line setup, the factory added a small alignment mark to the stator and crankcase, shown below. These marks are not usually present on other CDI-equipped models of this age. They can also be used to align the flywheel timing marks with a strobe, allowing much more accurate ignition timing adjustment.

Strobe Timing with the Fly Wheel Marks

The flywheel has three timing marks (see the pictures on the next page), the longer, which appears on the inner and the outer edge of the flywheel is the full advance mark. The shorter ones either side allow for different configurations on different models and are the respective retarded or 'static' positions.

If setting timing is not something you are familiar with, we suggest this task is deferred to someone with experience.

Set up marks used by the factory and described in the shop manual

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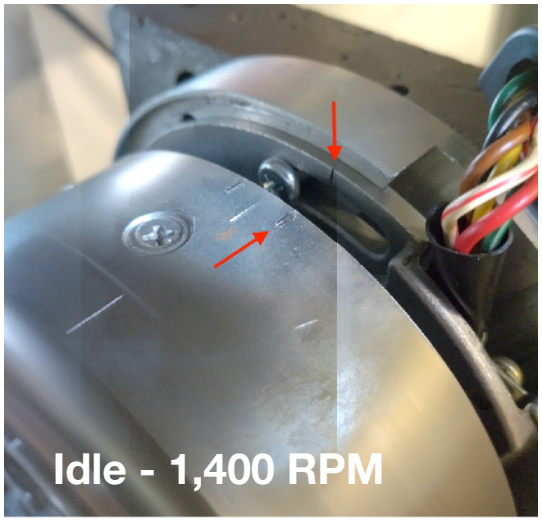
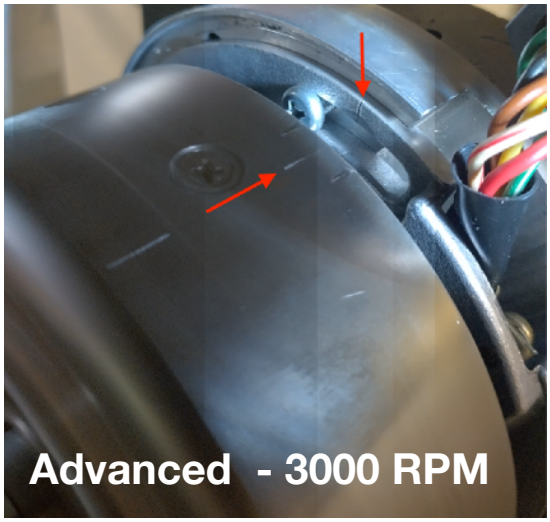
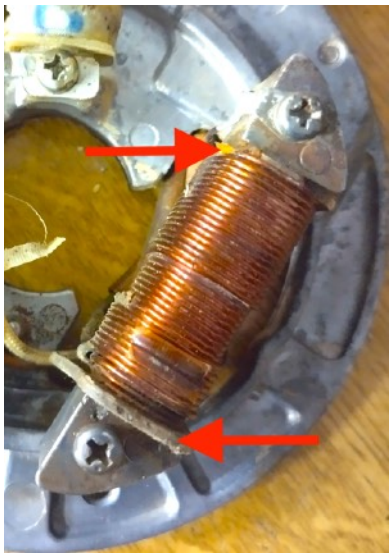




If you don't want to go to the trouble of setting up a DTI, a strobe lamp will give you fast and more accurate results. The short line will line up with the stator mark at idle, the more important one is the centre mark which must be aligned when the engine is at 3,000 RPM. Follow the shop manual regarding how to adjust the stator position and for the applicable RPM full advance must be reached.

Checking the lighting coil:
The lighting coil is wound from much heavier wire than the CDi source coil, it operates at a much lower voltage and it is more robust as a result. Signs of burning or mechanical damage to the copper will be obvious, however patchy discolouration, usually lighter in colour due to overheating maybe less easy to spot.



Check for:
General condition, the winding on the right has an end piece missing, a common issue on older generators. Both insulating end pieces must be intact, these prevent the copper from contacting the steel winding slot, they also form part of the mechanical support for the winding. If missing or damaged, the winding is no longer properly supported or sealed.

Check also the copper is tight on the steel former, firmly hold it with your fingers and attempt to move it back and forth towards the mounting screws, also attempt to twist it. Any movement of copper on the former, even slight shows a failure.

Lighting coil electrical test
Carry out the resistance tests as described in the workshop manual. These models were produced with different lighting coil configurations, but all are grounded, so readings are taken to the black ground wire or directly to the stator plate.

Lighting and charging coils use several metres of relatively thick copper wire, so their resistance will always be very low, typically between 0.2 Ω and 2 Ω. Readings within this range should be considered a pass. Obtaining an exact figure can be difficult, as many multimeters are not especially accurate at the very low end of the resistance scale. Do not be concerned if your readings do not exactly match the figures in the manual as sensible, stable readings are more important.

At Rex's Speed Shop we have years of experience rebuilding classic motorcycle ignition systems, we design and manufacture modern replacement CDI units and generator parts developed to meet the extremely high standards set by the original manufacturers.

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