Chapter 4 Ignition system

For information relating to the RD350 F II and N II models, refer to Chapter 8

Contents

Specifications

Ignition system	
Make	Nippon Denso
Type	Capacitor discharge ignition (CDI)
Pickup coil resistance (RD350 LC II model) white/red to white/green	115 ohms ± 20%
Pickup coil resistance (other models) white/red to white/green	117 ohms ± 20%
Source coil resistance (RD350 LC II model):	
Brown to green	225 ohms ± 20%
Brown to red	5.3 ohms ± 20%
Source coil resistance (other models):	
Brown to green	113 ohms ± 20%
Brown to red	4.1 ohms ± 20%
Ignition timing:	
@ 1200 rpm	17° BTDC
@ 3500 rpm	27° BTDC
Ignition coil	
Make	Nippon Denso
Type	12900-027
Minimum spark gap	6 mm (0.24 in)
Primary winding resistance	0.33 ohms ± 20% @ 20°C (68°F)
Secondary winding resistance	3.5 K ohms ± 20% @ 20°C (68°F)
CDI unit	
Make	Nippon Denso
Type:	
RD350 LC II	AOAB06
Other models	52Y
Spark plugs	
Make	NGK
Type	BR8ES
Electrode gap	0.7 – 0.8 mm (0.028 – 0.031 in)

1 General description

The Yamaha YPVS models covered by this manual are equipped with a capacitor discharge ignition (CDI) system. The arrangement is entirely electronic, and having no moving parts and can be considered maintenance-free. Unlike the earlier LC models the ignition system is not adjustable, obviating the need for timing checks whenever the alternator stator has been disturbed.

The ignition exciter, or source, coil assembly is housed within the flywheel generator, and provides the power supply for the external CDI unit, which is mounted beneath the right-hand side panel. The system is triggered by a magnet, incorporated in the outer face of the generator rotor, acting upon a pickup coil, known as a pulser, which is outrigged from the stator. The spark plugs are supplied from a single ignition coil, firing in both cylinders simultaneously. This system is known as the 'spare spark' system, as only one cylinder can fire, leaving one spark wasted, or 'spare'.

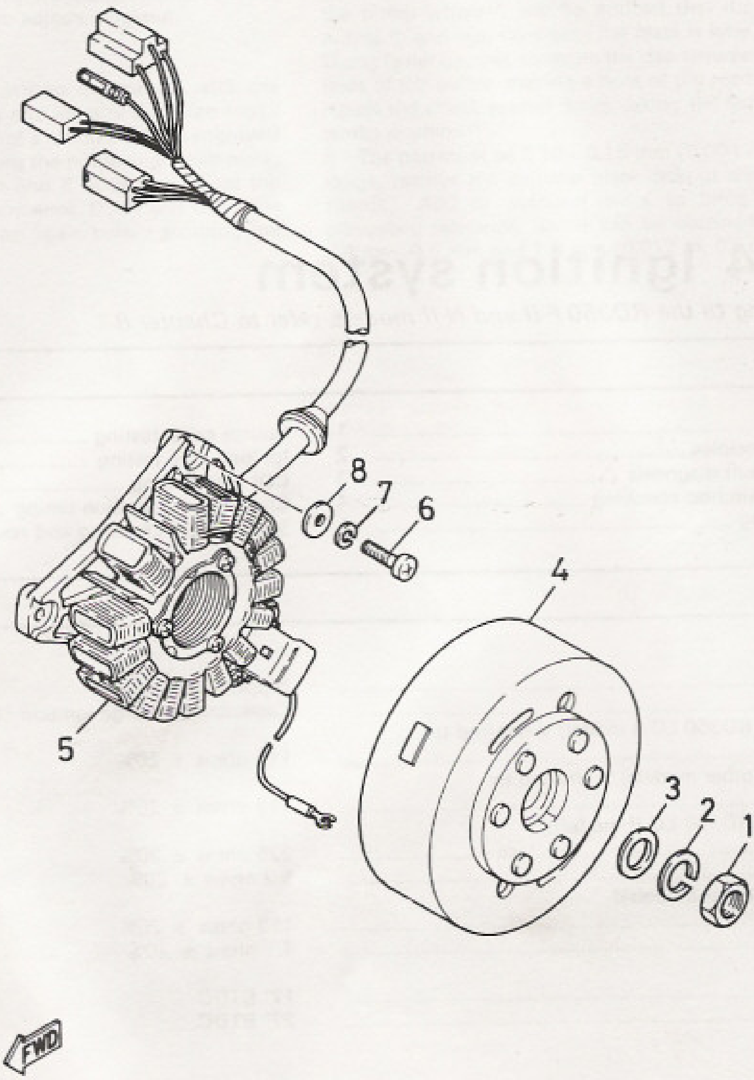


Fig. 4.1 Alternator

1 Nut	*3 Washer*	*5 Stator*	*7 Spring washer – 3 off*
2 Spring washer	*4 Rotor*	*6 Screw – 3 off*	*8 Washer – 3 off*

2 CDI system: operating principles

1 Energy for the ignition system is drawn from the exciter coil. This is mounted on the generator stator, and is integral with the normal alternator windings. It is a two-stage arrangement, having low speed and high speed windings. The low speed windings produce a high output voltage at low engine speeds, this voltage dropping off as the engine builds up speed. The high speed windings, on the other hand, produce little energy at low engine speeds, but the output voltage rises along with engine speed. The two outputs are combined, offsetting each other to give a fairly constant output voltage, this being the sum of the output of each set of windings.
2 The exciter coil assembly feeds the CDI unit, a sealed electronic assembly which forms the heart of the system. This unit contains, amongst other things, a capacitor and a thyristor, or silicon controlled rectifier (SCR). The capacitor is charged with the high voltage output from the exciter coil assembly. The thyristor, or SCR, is in effect an electronic switch. When signally electrically by the pulser, it allows the capacitor to discharge through the primary windings of the ignition coil. This in turn induces a high tension pulse in the secondary windings, which is fed to the spark plugs.
3 The pulser, or pickup, comprises a small coil mounted outside the alternator rotor on a projection from the stator. A permanent magnet embedded in the flywheel rotor is arranged to pass beneath the pulser coil. As the magnet passes the pulser coil, a weak current is generated and it is this that is used to trigger the thyristor in the CDI unit.

3 CDI system: testing and fault diagnosis

1 As stated earlier in this Chapter, the electronic ignition needs no regular maintenance once it has been set up and timed accurately. Occasional attention should, however, be directed at the various connections in the system, and these must be kept clean and secure. A failure in the ignition system is comparatively rare, and usually results in a complete loss of ignition. Usually, this will be traced to the CDI unit, and little can be done at the roadside to effect a repair. In the event of the CDI unit failing, it must be renewed as repair is not practicable.
2 If the CDI unit is thought to be at fault, it is recommended that it be

removed and taken to a Yamaha dealer for testing. The dealer will have the use of diagnostic equipment, and will be able to test the unit accurately and quickly. Testing at home is less practical and cannot be guaranteed to be accurate. At best, it will enable the owner to establish which part of the system is at fault, although replacement of the defective part remains the only effective cure.

3 Care must be exercised when dealing with the CDI unit. Wrong connections could cause instant and irreparable damage to the unit, so this must be an important consideration when removing and replacing the unit. If the unit is to be disconnected and removed for testing, use a short length of insulated wire to short-circuit each pair of terminals to avoid any electric shock from residual energy in the capacitor.

4 For those owners possessing a multimeter and who are fully conversant with its use, a test sequence is given below. It is not recommended that the inexperienced attempt to test the system at home, as more damage could be sustained by the system, and an unpleasant shock experienced by the unwary operator. It should be appreciated that the CDI system is capable, in certain circumstances, of producing sufficient current output to be dangerous to the operator. It follows that an attitude to safety should be adopted similar to that applying when testing household mains electricity. Before performing any tests, the following point must be noted. Disconnect all the connectors in the ignition system, thus isolating the various components.

5 It will be noted that some of the resistance tests require a meter capable of reading in ohms rather than kilo ohms. Many of the cheaper multimeters are only capable of the latter, and thus are of limited use for accurate testing of low-resistance components. When testing the ignition system to isolate faults it is important to follow a logical sequence to avoid wasted effort and money. Use the accompanying flow charts as a guide, referring to the subsequent sections for more detailed information.

4 Wiring, connectors and switches: checking

1 The single most likely cause of ignition failure or partial failure is a broken, shorted or corroded connector, switch contact or wire. Tracing faults of this nature can often prove time consuming but does not require the use of sophisticated test equipment. Although in rare instances a particular fault will not be evident from a physical examination, it is worthwhile checking the obvious points before resorting to expensive professional assistance.

2 Refer to the wiring diagram at the end of the book, trace and check each of the alternator output leads, connector blocks and all connections to the CDI unit, ignition switch and kill switch. Do not ignore the obvious; it can be very frustrating to spend a long time checking the ignition system, only to discover that the kill switch was set to the 'Off' position. The kill switch and some of the wiring connectors are relatively exposed and may have become contaminated by water. To eliminate this possibility, spray each one with a water dispersing aerosol such as WD40.

3 Check the wiring for breakages or chafing paying particular attention to the wiring in areas like the steering head where steering movement causes flexing. The plastic insulation may appear intact even if the internal conductor has broken. If a wire is suspected of having broken internally or shorted against the frame it should be checked using a multimeter as a continuity tester.

5 Pulser (pickup) coil: testing

1 Trace the alternator output wiring back to the connector blocks beneath the seat. Separate the pulser lead connector (White/red lead) and the three-pin connector carrying the leads to the CDI unit (Red, Brown and Black leads).

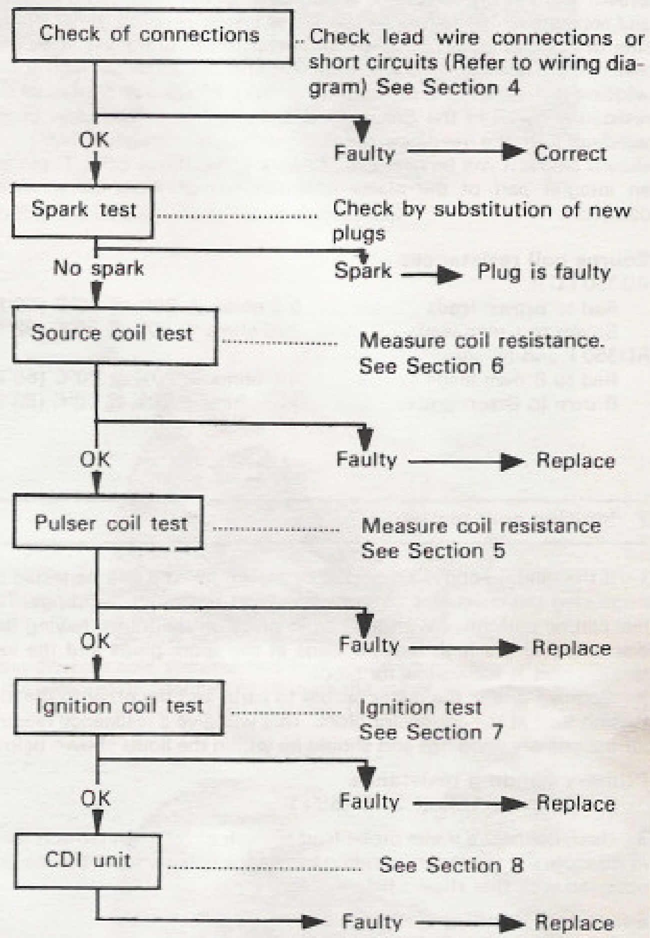
2 Using an ohmmeter or multimeter set at the ohms x 10 scale, measure the resistance between the White/red pulser lead and the Black earth lead. The pulser can be considered serviceable if the following resistance figures are obtained.

Pulser coil resistance

White/red to white/green lead:

RD350 LC II	115 ohms ± 20% @ 20°C (68°F)
RD350 F and N	117 ohms ± 20% @ 20°C (68°F)

a) No spark is produced, or weak spark



b) The engine starts but will not pick up speed

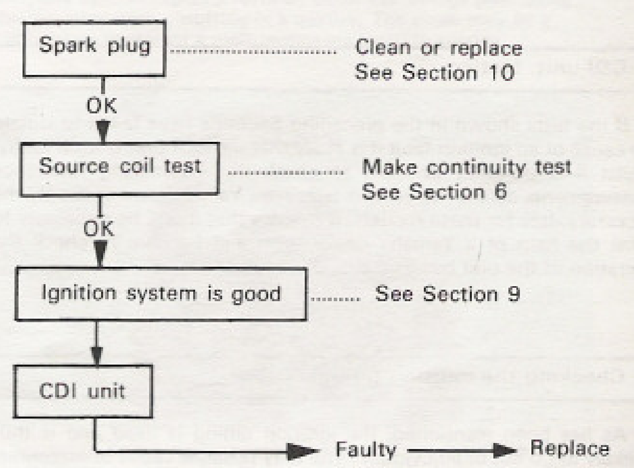


Fig. 4.2 Ignition system fault diagnosis flow chart

6 Source coils: testing

1 The source coils are connected to the CDI unit via three leads (Red, Brown and Green). Trace the wiring back to the three pin connector and separate it. The following resistance test is made on the alternator side of the connector. Set the multimeter to the ohms x 1 scale and measure the resistance between the Red and Brown leads (high speed windings). Next, set the meter to the ohms x 10 scale and measure the resistance between the Brown lead and the Green lead (low speed windings). If the readings obtained differ significantly from those shown below it will be necessary to renew the source coils. These are an integral part of the stator assembly, which must be renewed complete.

Source coil resistances

RD350 LC II:	
Red to Brown leads	5.3 ohms ± 20% @ 20°C (68°F)
Brown to Green leads	225 ohms ± 20% @ 20°C (68°F)
RD350 F and N:	
Red to Brown leads	4.1 ohms ± 20% @ 20°C (68°F)
Brown to Green leads	113 ohms ± 20% @ 20°C (68°F)

7.1 Ignition coil is bolted to frame below the fuel tank

7 Ignition coil: testing

1 If the ignition coil is suspected of having failed it can be tested by measuring the resistance of its primary and secondary windings. The test can be performed with the coil in place on the frame, having first disconnected the high tension leads at the spark plugs and the low tension lead at the connector block.

2 Connect one of the meter probes to earth and the other to the low tension lead at the connector block. This will give a resistance reading for the primary windings and should be within the limits shown below.

Primary winding resistance

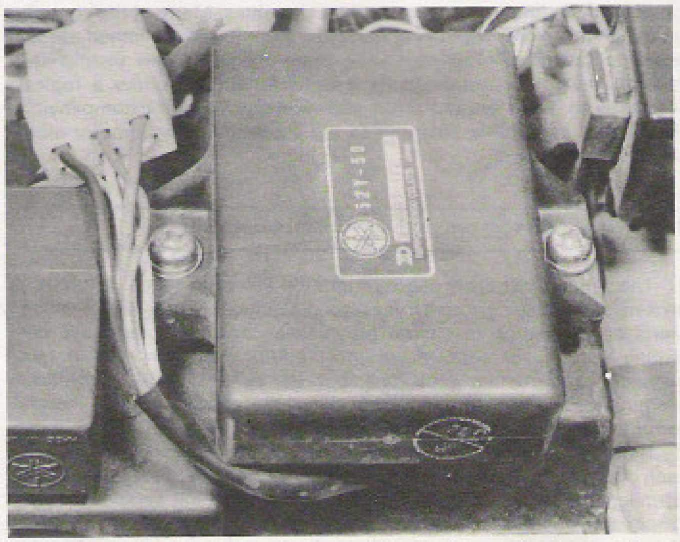
0.33 ohms ± 10% @ 20°C (68°F)

3 Next, connect a meter probe lead to each of the high tension leads to measure the secondary winding resistance and compare the reading obtained with that shown below.

Secondary winding resistance

3.5 kilo ohms ± 20% @ 20°C (68°F)

4 If either of the values obtained differs markedly from the specified resistances it is likely that the coil is defective. It is recommended that the suspect coil is taken to a Yamaha dealer who can then verify the coil's condition and supply a replacement unit where necessary. The coil is a sealed unit and therefore cannot be repaired.



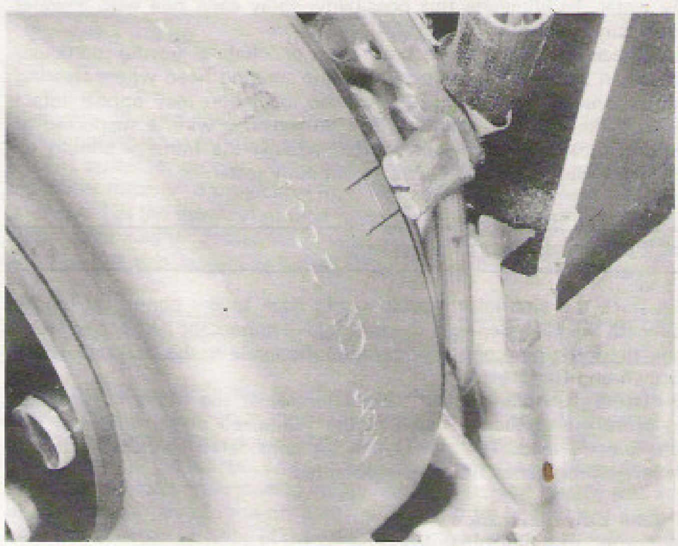
8.1 CDI unit is mounted to the rear of the ignition coil. Note wiring connector at top left of photograph

8 CDI unit: testing

If the tests shown in the preceding Sections have failed to isolate the cause of an ignition fault it is likely that the CDI unit is itself faulty. Whilst it is normally possible to check this by making resistance measurements across the various terminals, Yamaha do not supply the necessary data for these models. It follows that it will be necessary to enlist the help of a Yamaha dealer who will be able to check the operation of the unit by substituting a sound item.

9 Checking the ignition timing

As has been mentioned, the ignition timing is fixed and is thus unlikely to go out of adjustment. The only possible cause of inaccurate ignition timing is an internal fault in the CDI unit or a full or partial failure of the pickup coil windings. Timing marks are provided on the rotor edge, and those possessing a suitable strobe lamp may wish to check the timing in the event of a suspected fault. It will be appreciated that this is of academic interest only; no adjustment being possible.



9.1 Ignition timing can be checked using strobe lamp, but no adjustment is possible

Spark plug maintenance: Checking plug gap with feeler gauges

Altering the plug gap. Note use of correct tool

Spark plug conditions: A brown, tan or grey firing end is indicative of correct engine running conditions and the selection of the appropriate heat rating plug

White deposits have accumulated from excessive amounts of oil in the combustion chamber or through the use of low quality oil. Remove deposits or a hot spot may form

Black sooty deposits indicate an over-rich fuel/air mixture, or a malfunctioning ignition system. If no improvement is obtained, try one grade hotter plug

Wet, oily carbon deposits form an electrical leakage path along the insulator nose, resulting in a misfire. The cause may be a badly worn engine or a malfunctioning ignition system

A blistered white insulator or melted electrode indicates over-advanced ignition timing or a malfunctioning cooling system. If correction does not prove effective, try a colder grade plug

A worn spark plug not only wastes fuel but also overloads the whole ignition system because the increased gap requires higher voltage to initiate the spark. This condition can also affect air pollution

10 Spark plugs: checking and resetting the gaps

1 The RD350 YPVS models are fitted as standard with NGK BR8ES spark plugs. The plugs have an internal resistor, denoted by the "R" in the type number, and it is vital that the original grade and type of plug is fitted when replacement is required. There have been instances where the YPVS valve has been upset due to the wrong plug type being used. This is caused by spurious signals being fed to the YPVS microprocessor, which reads the ignition system pulses to gauge the valve opening angle. To avoid problems of this nature, always use the recommended grade of plug.

2 Check the gap of the plug points at every six monthly or 4000 mile service. To reset the gap, bend the outer electrode to bring it closer to, or further away from the central electrode until a 0.7 mm (0.028 in) feeler gauge can be inserted. Never bend the centre electrode or the insulator will crack, causing engine damage if the particles fall into the cylinder whilst the engine is running.

3 With some experience, the condition of the spark plug electrodes and insulator can be used as a reliable guide to engine operating conditions. See the accompanying series of colour photographs.

4 Always carry spare spark plugs of the recommended grade. In the rare event of plug failure, this will enable the engine to be restarted.

5 Beware of over-tightening the spark plugs, otherwise there is risk of stripping the threads from the aluminium alloy cylinder heads. The plugs should be sufficiently tight to seat firmly on their copper sealing washers, and no more. Use a spanner which is a good fit to prevent the spanner from slipping and breaking the insulator.

6 If the threads in the cylinder head strip as a result of overtightening the spark plugs, it is possible to reclaim the head by the use of a Helicoil thread insert. This is a cheap and convenient method of replacing the threads; most motorcycle dealers operate a service of this nature at an economic price.

7 Make sure the plug insulating caps are a good fit and have their rubber seals. They should also be kept clean to prevent tracking.