

# CDI Electronics®

## Six Cylinder Engines

(1988-2001 185-250 HP Quick-Start Models)

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

(Note) These engines usually have a 35 Amp battery charging capacity. Due to the size and weight of the flywheel magnets, it is highly recommended that you check to make sure both the triggering and charge magnets are still secure in the flywheel before you service the engine. A loose or broken magnet can be deadly to you or your pocketbook. It is a recommended you index the flywheel and check the timing on all cylinders when servicing these engines. Also check for static firing and intermittent spark.

### NO SPARK ON ANY CYLINDER:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	900-1100 (35 amp)	150-400 V	150-400 V (*)
Orange	Orange/Black	93-103	11-22 V	45-120 V (*)
White	Purple	(c)	100-400 V (a)	0.6 V + (#)
White	Blue	(c)	100-400 V (a)	0.6 V + (#)
White	Green	(c)	100-400 V (a)	0.6 V + (#)
White	Purple (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Blue (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Green (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Black/White (2nd connector)	215-225	6-12 V (b)	6-12 V (from pack)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) DVA will drop below 1 V when the engine drops out of Quick-Start (engine is over 104 Degrees or 1200 RPM).

(c) Use a comparison reading as different brands of meters will give different readings. The typical range is 1M to 5M ohms. As long as you have approximately the same ohm reading on all six tests and the correct output with the DVA meter, the timer base should be good. Remember that temperature will affect the readings. The exception would be if one of the SCR's inside the timer base is breaking down while the engine is running. This can be found indexing the flywheel and checking the timing on all cylinders. If the readings are off, reverse the meter leads and retest to see if the readings are corrected.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE BANK:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition now has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
3. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
4. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
5. Check the stator resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
6. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one bank, disconnect the Orange wires from the ignition coil for that bank and reconnect them to a load resistor. Retest. If the reading is now good, one or all of the ignition coils are likely bad. A continued low reading indicates a bad power pack.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
2. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack or timer base.

4. Check the power pack resistance given below:

Wire Color (CYL)	Check to Wire Color	Resistance
Orange/Blue (#1)	Blue (in 4 pin connector with Black/White wire)	110 (a)
Orange (#3)	Purple (in 4 pin connector with Black/White wire)	110 (a)
Orange/Green (#5)	Green (in 4 pin connector with Black/White wire)	110 (a)
Orange/Blue (#2)	Blue (in 4 pin connector with White wire)	110 (a)
Orange (#4)	Purple (in 4 pin connector with White wire)	110 (a)
Orange/Green (#6)	Green (in 4 pin connector with White wire)	110 (a)
White	Black (Engine Ground)	Shorted
Brown	Black (Engine Ground)	Open or M range
Brown/Yellow	Black (Engine Ground)	Open or M range
Brown/White	Black (Engine Ground)	Open or M range
Brown/Black	Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires. You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

5. Check the spark plug wires for breaks and abrasions.
6. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
7. Swap the ignition coil with one that is sparking correctly.
8. Rare causes include a weak trigger magnet. If possible, try another flywheel.

### **POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:**

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### **ENGINE WILL NOT SHUT OFF:**

Disconnect the stop wires at the power pack. Connect a jumper wire to the stop wires from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### **MISS AT ANY RPM:**

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V DVA maximum. A sharp drop in DVA right before the miss becomes apparent on all cylinders will normally be caused by a bad stator. A sharp drop in DVA on less than all cylinders will normally be the power pack or timer base.
3. Connect an inductive tachometer to each cylinder in turn and try to isolate the problem. A high variance in RPM on one cylinder usually indicates a problem in the power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
4. Perform a high-speed shutdown and read the spark plugs. Check for water. A crack in the block can cause a miss at high speed when the water pressure gets high, but a normal shutdown will mask the problem.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

### **ENGINE WILL NOT ACCELERATE BEYOND 2500 RPM (Runs smooth below that RPM):**

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, test and replace the defective temperature switch.
3. Make sure the tan temperature switch wire is not located next to a spark plug wire.
4. Disconnect the VRO sensor from the engine harness and retest. If the engine performs correctly, replace the VRO or sensor.

### **ENGINE DIES WHEN QUICK-START DROPS OUT:**

Check ignition timing at idle with the White/Black temperature wire disconnected. Remember to allow for the drop in ignition timing when Quick-Start disengages. Verify ignition timing after engine has warmed up, according to the service manual.

### **ENGINE STAYS IN QUICK-START:**

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage over 2 volts on this wire while the engine is running, the Quick-Start will not disengage. A voltage of 5 to 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
2. Short the White/Black temperature switch wire FROM the power pack to engine ground. Start the engine, if the Quick-Start drops out after approximately 5 seconds, replace the White/Black temperature switch.
3. Disconnect the Black/White wire from the power pack. If the Quick-Start feature is not now working, replace the power pack.

### **ENGINE WILL NOT ENGAGE QUICK-START:**

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.



3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

#### **ENGINE TIMING TOO HIGH:**

1. Check the flywheel center hub magnet to make sure it's tight. Look for signs of cracks and bulges in the Brown ferret magnet material.
2. Short the White/Black temp wire to engine ground and see if the timing drops back to normal.
3. Check the DC voltage on the Black/White wire going to the timer base. With the White/Black temp wire disconnected, the voltage should be 6 to 10 volts. When the White/Black temp wire is shorted to engine ground, the voltage should drop out. If the voltage on the Black/White wire stays in the 6-10 volt range, disconnect the Yellow/Red wire from the power pack. The voltage should drop out on the Black/White wire. If it does, the harness or starter solenoid is likely defective. If the voltage on the Black/White wire stays in the 6-10 volt range with the Yellow/Red wire disconnected and the White/Black wire shorted to engine ground, the power pack is defective.

