Installation and Troubleshooting Guide

This installation is to be completed by an Authorized Dealer or Professional Service Technician. For questions regarding installation or warranty, call CDI Tech Support at 866-423-4832. Do not return to the Dealer or Distributor where the part was purchased. Contact CDI Electronics Directly for Return Material Authorization.

CDI P/N: 173-4981

This unit replaces P/N's: 584109, 584981, and 763759.

Warning! This product is designed to be installed by a professional marine mechanic. CDI Electronics cannot be held liable for injury or damage resulting from improper installation, abuse, neglect, or misuse of this product.

DO NOT OPERATE ENGINE WITH PLASTIC ENCODER COVER OFF OF THE ENGINE.

This unit requires special inductive spark plug wires and spark plugs. Please use the Factory Recommended Champion QL78YC (0.030 Gap) Spark Plugs and the inductive Gray or Blue spark plug wires (Order CDI P/N: 931-4921 for a set of 6 wires).

INSTALLATION

1. Remove the Negative battery cable.
2. Remove Encoder wheel cover, Power Pack cover, and Voltage Regulator cover (Between the timing cover and the Power Pack).
3. Disconnect the Optical sensor wire connector from the Optical sensor.
4. Disconnect the Stator leads from the Power Pack and Voltage Regulator.
5. Carefully disconnect and remove the throttle linkage connected to the flywheel cover.
6. Carefully remove the sensor support return spring between the flywheel cover and the Optical sensor support assembly and set aside.
7. Remove the bolt securing the Encoder wheel and CAREFULLY remove the Encoder wheel, making sure not to crack or damage it in any way. Pay special attention to the timing pointer. Carefully move the timing pointer away from the Encoder wheel enough to pull the Encoder wheel up and off without loosening the timer pointer. If the timer pointer is loosened, it will have to be recalibrated by calibrating cylinder #1 with a dial indicator to TDC. If the Encoder wheel is damaged it will need to be replaced.
8. Remove the five Pozidriv screws holding the Optical sensor support retainers down that secure the Optical sensor support assembly in place.
9. Remove the Optical sensor assembly from the flywheel cover.
10. Remove the flywheel cover. Watch for the Bendix washers and do not lose them.
11. Unbolt the flywheel.
12. Using the correct flywheel puller, remove the flywheel according to the service manual for your engine.
13. Remove the original Stator, saving the mounting bolts.
14. Install the new Stator using the original bolts with a good thread-locker applied to the bolts and tightened to the factory torque specifications.
15. Connect the new Stator to the Power Pack.
16. Replace the flywheel according to the service manual for your engine.
17. Replace the flywheel cover. Be sure the Bendix washers are in place and that the Bendix is lubricated.
18. Carefully connect the throttle linkage to the flywheel cover.
19. Apply a light coat of marine grade grease to the sliding surfaces of the Optical sensor support. Position the Optical sensor support in the flywheel cover. Position the two Optical sensor support retainers and tighten the five Pozidriv screws. Check to see that the Optical sensor support arm rotates freely.
20. Attach the Optical sensor support return spring to the Optical sensor support assembly and to its post on the flywheel cover.
21. Reinstall the Encoder wheel by carefully moving the timing pointer out of the way just enough to slide the Encoder wheel on to the crankshaft. The Encoder wheel is slotted for a keyway and will only go on one way.
22. Install the Encoder wheel retaining bolt to the crankshaft using a thread locking compound and tighten to 120-140 in. lbs.
23. Reinstall the timing cover and tighten the three Pozidriv screws.
24. Connect the Optical sensor plug connector.
25. Connect the negative battery cable.
26. Replace Verify the ignition timing and reset according to the service manual.

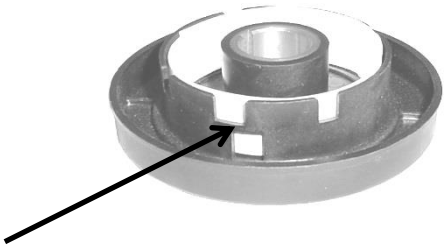
TROUBLESHOOTING

NO SPARK ON ANY CYLINDER:

1. Disconnect the port 4 pin connector on the Power Pack that holds the Black/Yellow stop wire 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. Disconnect the Yellow wires from the Stator to the Voltage Regulator and retest. If the engine sparks, replace the Voltage Regulator.
3. Check the cranking RPM. A cranking speed of less than 250 RPM will not allow the system to spark properly. This can be caused by a weak battery, dragging starter, bad battery cables, or a mechanical problem inside the engine.
4. Check the Stator resistance and DVA as given below:

Read from	Read to	Ohms	DVA (Connected)	DVA (Disconnected)
Brown (Stator)	Brown/Yellow (Stator)	450-600 Ω	150-400 V	150-400 V
Brown/White (Stator)	Brown/Black (Stator)	450-600 Ω	150-400 V	150-400 V
Orange (Power coil)	Orange/Black (Power coil)	50-60 Ω	11-22 V	45-120 V

5. Verify the engine is turning in a clockwise direction. If not, see (**ENGINE TRIES TO RUN BACKWARDS**).
6. Check the Power Pack and Ignition coil ground wires for corrosion and tightness.
7. If the engine loses spark after the key switch is disengaged, check the DVA on the Stator's Power Coil. If the DVA is low, the Stator is likely defective.
8. Check the battery voltage on the Yellow/Red wire while cranking the engine. If below 11 VDC, charge the battery and check all battery cables. A continued low battery reading could be caused by a dragging starter, a faulty starter solenoid, or a faulty key switch.
9. Remove the Optical sensor wheel and check for damage, especially where the top slots are located. Sometimes the wheels will break out where the windows overlap.



The thin area between the crank position and the cylinder position is the most common breakout location.

10. Check the Optical sensor eyes for dirt, grease, etc. If you have to clean it, use denatured alcohol and a Q-tip. Do not use any other cleaning agent because damage to the Optical lens will occur.
11. Check the Power Pack DVA to the Primary coil wires as follows:

Read from	Read to	DVA (Connected)
Orange/Blue	Engine Gnd	150 V Minimum
Orange	Engine Gnd	150 V Minimum
Orange/Green	Engine Gnd	150 V Minimum

NOTE: If the Orange Primary DVA reading is low on one cylinder, disconnect the wire from the Ignition coil for that cylinder and reconnect it to a Pack Load resistor (CDI P/N 511-9775). Retest. If the reading is now within specification, the Ignition coil is likely defective. If it still measures low, this indicates a defective Power Pack If the Optical sensor tests within specification.

12. Check the Optical sensor DC voltage as follows:

Read from	Read to	OEM DC (Connected)	CDI DC (Connected)
Orange/Red (Input from Power Pack)	Engine Gnd	11 V Minimum	9.5 V Minimum
Black/Orange (Return from Optical sensor)	Engine Gnd	9 V Minimum	7.5 V Minimum

WARNING! The Black/Orange wire should NEVER be shorted to engine ground as this will damage the sensor.

NOTE: When checking the Optical sensor, there can be only a maximum voltage difference of 2 V DC between the input voltage and the return voltage. If the voltage difference is more than 2 V, or if the input voltage and the return voltage are equal (given that the input voltage is at an acceptable reading), replace the Optical sensor.

13. Check the Charge coil flywheel magnets for cracked, broken, or loose magnets.

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ONLY HAS SPARK AS LONG AS THE KEY SWITCH IS ENGAGED OR WILL NOT REV ABOVE IDLE SPEED:

1. Check the DVA on the Stator's Power coil.
2. As the engine RPM increases, the DVA should rapidly increase and stabilize up to 22 DVA (voltage exceeding 22 DVA indicates a bad Power Pack). A sharp drop in voltage right before the miss becomes apparent usually indicates a bad Stator Charge coil winding. A sharp drop in voltage when you disengage the key switch indicates a bad Power coil on the Stator.

ENGINE TRIES TO RUN BACKWARDS:

1. Check the encoder wheel. It must have 7 notches.
2. Check the ignition timing. Before Quick Start, it should be set to 2-6° BTDC. After Quick Start, it should be set to 4-6° ATDC.
3. If possible, try another Optical sensor.
4. If still no change, replace the Power Pack.

NO SPARK OR INTERMITTENT SPARK ON ONE BANK:

1. Check the Stator resistance and DVA (see **NO FIRE ON ANY CYLINDER**).
2. Disconnect the 4-pin connector on the port side of the Power Pack and see if the fire returns. If it does, check resistance to see if the Black/Yellow wire is shorted to engine ground or is intermittently shorting to ground.

NO SPARK ON ONE CYLINDER:

1. Check the DVA on the Orange primary wire going to the Ignition coil not firing. You should have a reading of 150 DVA or more.
2. Check the resistance of the Ignition coil secondary circuit in reference to engine ground. A difference of over 25 Ω indicates a defective Ignition coil.
3. Check the resistance of the spark plug wire. Normally, you will read approximately 100 Ω between the connectors on either end.

POWER PACK REPEATEDLY BLOWS ON SAME CYLINDER:

1. Replace the Ignition coil on the cylinder dropping spark.

ENGINE WILL NOT STOP (KILL):

1. Disconnect the stop wire at the Power Pack. Connect a jumper wire to the stop terminal in the Power Pack and short it to engine ground. If this stops the Power Pack from sparking, the stop circuit has a fault. Check the key switch, harness, and shift switch.

ONLY SPARKS #1 CYLINDER:

1. Verify the engine is spinning in a clockwise direction.
2. Check the Optical sensor to encoder wheel alignment. You may need to shim the Optical sensor upwards 0.020" to 0.0285" to make it engage the encoder wheel.

HIGH SPEED MIS-FIRE OR WEAK HOLE SHOT:

1. Connect DVA meter to between the Brown wires and do a running test. At no time should the voltage exceed 400 DVA. If it does, the Regulator circuit in the Power Pack is bad. The voltage should show a smooth climb and stabilize, gradually falling off above 5000 RPM. If you see a sudden drop in voltage right before the miss becomes apparent, the problem is likely in the Stator.
2. Disconnect the Yellow wires from the Stator to the Voltage Regulator and retest. If the miss clears, replace the Voltage Regulator.
3. Check the DVA on the Orange primary wires from the Power Pack while connected to the Ignition coils. You should have a reading of at least 150 DVA or more, increasing with engine RPM until it reaches 300-400 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.
4. Connect an inductive tachometer to the spark plug wires one at a time and compare the readings. If most of the cylinders show the same reading and one or two show different readings, check the primary wires with the inductive pickup to see if the readings are the same from the Power Pack. A difference in readings between the primary and secondary coil wires usually indicates a bad coil or bad ignition wires. No difference indicates a bad Power Pack.
5. Perform a high speed shutdown and read the spark plugs. Check for a black porcelain insulator or one that looks brand new. A crack in the block can cause a miss at high speed when the water pressure gets high and sprays water into the cylinder, but a normal shutdown will mask the problem.
6. Check the Charge coil flywheel magnets for cracked, broken, or loose magnets.

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BATTERY CHARGING ISSUES:

1. Regardless of whether the charging issue is overcharging or not charging at all, the #1 cause of all charging issues is the battery often due to improper style and/or charging neglect. #2 is the battery's connections. #3 is the Voltage Regulator. #4 is the Stator.
2. The recommended type of battery for outboards is a single (NOT more than one) 850+ CCA dual purpose or cranking/starting **non-maintenance-free battery**.
3. Non-maintenance-free batteries (lead-acid flooded cell; has vent caps on its top) have heavy, thick plates. They're ideal for outboards, where batteries are commonly drained by accessories while fishing, etc. when there is no charge applied to a battery while the battery is in use. Its heavy plates can withstand constant discharging and charging. These batteries have much more reserve time and are much more suited for this behavior.

   NOTE: Some Maintenance free batteries will have vented caps on top. When in doubt, change the battery to a non-maintenance free type.

4. Maintenance-free batteries should ***NEVER*** be used in an Outboard application. A new, fully charged maintenance-free battery may work fine at first but their life span is dramatically shortened due to the constant charging and discharging. This activity will cause the cells to become weak, and/or the cells will become dead. When this happens, the battery is unable to accept a full charge, thus putting the Voltage Regulator at extreme risk of failure. Therefore, maintenance-free style batteries commonly cause charging issues shortly after installation.
5. Check all battery connections, particularly at engine ground. Make sure that all connections are tight and free of corrosion. Do ***NOT*** use wing nuts as they tend to loosen over a period of time from vibration. A loose connection ***WILL*** cause a premature battery and/or Voltage Regulator failure(s).
6. If there is no change, try a single (***NOT*** more than one) known good fully charged battery that is 850+ CAA Dual Purpose, or a cranking/starting battery that is non-maintenance free. Make sure the battery is a lead acid flooded cell battery (has vent caps on its top).
7. Measure the DVA across the Stator's Yellow battery charge wires, while connected to the Voltage Regulator. At idle the DVA will normally between 8-25 DVA. If not, disconnect the Yellow wires from the Voltage Regulator and retest. DVA will normally be 17-50 DVA at idle. If the voltage is low, the Stator is possibly faulty. Perform a visual of the Stator for browning and varnish dripping. These are signs that the Stator has overheated. If the visual inspection shows any of these signs, replace the Stator.

TACHOMETER TESTS

1. Measure the DVA across the Stator's Yellow battery charge wires, while connected to the Voltage Regulator. At idle the DVA will normally be between 8-25 DVA. If not, disconnect the Yellow wires from the Voltage Regulator and retest. DVA will normally be 17-50 DVA at idle. If the voltage is now within specification, the Voltage Regulator is likely defective.
2. Disconnect the Voltage Regulator's Gray wire. At 800-1,000 RPM, check the DVA on the Grey wire FROM THE VOLTAGE REGULATOR measured to engine ground. The reading should be 8 DVA or more. If not, replace the Voltage Regulator.
3. If at least 8 DVA, run a jumper wire from the Gray wire out of the harness to one of the Stator's Yellow wires.
4. If still no tachometer signal, try a known good tachometer.
5. If still no tachometer signal, replace the Stator.

CHECKING MAXIMUM BATTERY CHARGE OUTPUT:

1. Install an ammeter capable of reading the maximum output in line on the Red wire connected to the starter solenoid.
2. Connect a load bank to the battery.
3. In the water or on a Dynamometer, start the engine and bring the RPM up to approximately 3500.
4. Turn on the load bank switches to increase the battery load to match the rated output of the Stator (35 amps).
5. Check the ammeter.
6. If the amperage is low,

   A) Check the Purple wire for voltage while the engine is running. You should see the same voltage as the battery.
   B) Connect a jumper wire from the Positive battery cable to the Purple wire and recheck the ammeter. If the amperage is now correct, there is a problem in the harness or key switch.

7. If the amperage is correct, but the battery voltage remains low, replace the battery.