# 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: 174-9710K 1

This unit replaces the following 2, 3, and 4 cylinder P/N's: 398-818535A17 and A18. 398-9710A11, A12, A14, A15, A17, A18, A22, A23, A25, A28, A30, A31, A33, A34, A35 A36, A38, A39, A43, A45, A46, A47, A48, and A49. 398-9873A 4, A 9, A17, A19, A24, A25, A29, A32, A33, A35, and A38. 398-81853517, and F747095.

**Warning! This product is designed for installation 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.**

***Note: 174-9710K1 requires a Voltage Regulator, DO NOT USE WITH A RECTIFIER ONLY.***

It is recommended that dielectric grease (i.e. CDI 991-9705) be used in the bullet nose connectors to help prevent corrosion.

Any sign of leakage out of the Ignition charge coils or bubbling around the battery charge windings indicate a bad Stator. Check for burned marks on each pole. If a problem is found on the battery windings, we recommend the Voltage Regulator be closely checked. To replace Stators with ring terminals, please use the fork terminals enclosed with this Stator.

***If this Stator is to be used as a replacement for the Mercury "Red" Stator, connect all wires to the Switchbox in their designated position. The Adapter Module used with the Red Stator is no longer needed.***

***If this Stator is to be used on a three cylinder engine, connect the Red/White and Blue/White striped wires to engine ground.***

## INSTALLATION

1. Disconnect the Negative battery cable.
2. Disconnect the Stator wires from the Switchbox, engine ground, and the Voltage Regulator.
3. Remove the flywheel according to the service manual for your engine.
4. Mark the position of the mounting screws in relation to where the Stator wires come out of the old Stator and remove the old Stator.
5. Orient and install the new Stator (using a good thread locker applied to the bolts) in the same position as the old Stator on the engine and install the flywheel by following the service manual instructions.
6. Connect the Yellow wires from the Stator to the Voltage Regulator, ignoring any stripes on the Voltage Regulator's Yellow wires.
7. Connect the Stator leads as follows:

| New Stator | 2 Cylinder Switchbox | 3 Cylinder Switchbox | 4 Cylinder Switchbox |
|---|---|---|---|
| Red (High speed Coil) | Red (High speed Coil) | Red (High speed Coil) | Red (High speed Coil) |
| Blue (Low speed Coil) | Blue (Low speed Coil) | Blue (Low speed Coil) | Blue (Low speed Coil) |
| Red/White (High speed Coil) | Red/White (High speed Coil) | Engine Ground | Red/White Stripe (High speed Coil) |
| Blue/White (Low speed Coil) | Blue/White (Low speed Coil) | Engine Ground | Blue/White Stripe (Low speed Coil) |

7. If this Stator is to be used on a 3 cylinder engine application, connect the Red/White and Blue/White striped wires to a known good engine ground.
8. If using this Stator on an application that uses a Switchbox with stud connections, it will be necessary for you to remove the female bullet connectors attached to the Blue, Blue/White, Red, and Red/White wires that are preinstalled from the factory and install the fork terminals that come supplied in the kit provided with the Stator. Crimp or solder the fork connectors to the Blue, Blue/White, Red, and Red/White wires.
9. If your engine used a Mercury Red Stator Kit, it is normal for that application to have NOT used the Red and the Red/White wire (or Red and Red/White stud post on a studded Switchbox). These are usually either taped up or capped off. With the CDI Electronics 194-9710K 1 Stator, the Red and Red/White wire **WILL** be used. Find the Red wire (or Red stud post on a studded Switchbox) and connect the Solid Red wire from the New Stator to the Switchbox. On a 2 and 4 cylinder application, connect the Red/White wire to the switchbox in its appropriate place. On a 3 cylinder application, connect the remaining Red/White and Blue/White striped wires to a known good engine ground.
10. Replace the flywheel according to the service manual.
11. Connect the Negative battery cable.


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# TROUBLESHOOTING

## HOW TO TEST THE ENGINE STOP CIRCUIT (KILL) FOR DC VOLTAGE:

1. DC voltage present on the kill circuit of the Switchbox due to a faulty key switch, boat harness, or engine harness will severely damage the Switchbox's internal kill circuit**.** Connect a Digital Multi Meter to the Ignition Stop wire(s) AT THE SWITCHBOX while disconnected from the Switchbox in reference to a known good engine ground. Turn the Ignition switch on and off several times. If, at any time, you see over 2 VDC on the kill wire(s), there is a problem with one or both harnesses and/or the Ignition switch. The Ignition Stop wire should not be connected back to the new Switchbox at any point until the problem is corrected **OR DAMAGE TO THE SWITCHBOX WILL OCCUR**!

## NO SPARK ON ANY CYLINDER:

1. Perform a visual inspection of the Stator and Trigger wiring to the Switchbox. Check to make sure that the wiring is correct, clean, and free of corrosion, and that all connections are tight.
2. Disconnect the Black/Yellow kill wire AT THE SWITCHBOX and retest. If the engine's Ignition now has spark, the stop circuit has a fault. Check the key switch, harness, and shift switch (if present).
3. Disconnect the Yellow wires from the Stator to the Voltage Regulator and retest. If the engine now has spark, replace the Voltage Regulator.
4. Check the cranking RPM. A cranking speed 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.
5. Check the Stator and Trigger resistance and DVA for your engine in the lists below:

Check the 2 cylinder engine as follows:

| Read from | Read to | Ohms | DVA (Connected) | DVA (Disconnected) |
|---|---|---|---|---|
| Blue (Low speed Coil) | Blue/White (Low speed Coil) | 500-700 Ω | 180 V Minimum | 180 V Minimum |
| Red (High speed Coil) | Red/White (High speed Coil) | 28-32 Ω | 25 V Minimum | 25 V Minimum |
| Purple (#1 Trigger) | White (#2 Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| Purple (#1 Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| White (#2 Trigger) | Engine Gnd | Open | 1 V Minimum | - |

Check the 3 cylinder engine as follows:

| Read from | Read to | Ohms | DVA (Connected) | DVA (Disconnected) |
|---|---|---|---|---|
| Blue (Low speed Coil) | Blue/White (Engine Gnd) | 500-700 Ω | 180 V Minimum | 180 V Minimum |
| Red (High speed Coil) | Red/White (Engine Gnd) | 28-32 Ω | 25 V Minimum | 25 V Minimum |
| Brown (Trigger) | White/Black (or Black) (Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| White (Trigger) | White/Black (or Black) (Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| Purple (Trigger) | White/Black (or Black) (Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| Brown (Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| White (Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| Purple (Trigger) | Engine Gnd | Open | 1 V Minimum | - |

***NOTE: The 3 cylinder engines have several configurations to the firing order. Please refer to the Factory Service Manual to make that determination. The pairing should always be as follows:***

- ***Green Coil Wire goes with the Brown Trigger Wire***
- ***Green/Red Coil Wire goes with the Purple Trigger Wire***
- ***Green/White Coil Wire goes with the White Trigger Wire***

Check the 4 cylinder engine as follows:

| Read from | Read to | Ohms | DVA (Connected) | DVA (Disconnected) |
|---|---|---|---|---|
| Blue (Low speed Coil) | Blue/White (Low speed Coil) | 500-700 Ω | 180 V Minimum | 180 V Minimum |
| Red (High speed Coil) | Red/White (High speed Coil) | 28-32 Ω | 25 V Minimum | 25 V Minimum |
| Purple (#1 Trigger) | White (#2 Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| Brown (#3 Trigger) | White/Black or Black (#4 Trigger) | 0.8-1.4K Ω | 4 V Minimum | 4 V Minimum |
| Purple (#1 Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| White (#2 Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| Brown (#3 Trigger) | Engine Gnd | Open | 1 V Minimum | - |
| White/Black (#4 Trigger) | Engine Gnd | Open | 1 V Minimum | |


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6. Inspect the flywheel Trigger and Stator magnets to see if they are loose or broken. Disconnect the Voltage Regulator and retest. If the spark returns, replace the Voltage Regulator.
7. Disconnect Red and Red/White wires and retest. If the DVA tests above is withing specifications, the Switchbox is usually bad.

### NO SPARK ON 2 CYLINDERS (4 CYLINDER ENGINE):

1. DVA test Stator (see **NO SPARK ON AN CYLINDER**).
2. Swap the Blue with the Blue/White Stator leads, and the Red with the Red/White Stator leads to see if the no spark problem changes. If it does, the Stator is bad. If the problem remains on the same cylinder(s), the Switchbox or Trigger is probably at fault.

### HIGH SPEED MISFIRE OR WEAK HOLE SHOT:

1. Connect DVA meter to the Blue and Blue/White wires and do a running test. The voltage should show a smooth climb and stabilize, gradually falling off at higher RPM's (above 3,000). If you see a sudden drop in voltage right before the miss becomes apparent, the Stator is likely at fault.
2. Connect DVA meter to the Red and Red/White wires. The voltage should show a smooth climb throughout the RPM range, a sudden drop or decline in voltage indicates a problem usually found in the Stator, although a Voltage Regulator can cause the same symptom.
3. Disconnect the Voltage Regulator and retest. If the problem disappears, replace the Voltage Regulator and retest.
4. Rotate the Stator one bolt hole in either direction and re-test. If the miss is gone, leave the Stator as is. If the miss is worse, rotate the Stator back where it was.

### ENGINE WILL NOT STOP (KILL):

1. Disconnect the Black/Yellow (or Orange) wire(s) at the Switchbox. Connect a jumper wire to the stop wire from the Switchbox and short it to engine ground. If this stops the Switchbox from sparking, the stop circuit has a fault. Check the key switch, harness, and shift switch (if present). If this does not stop the Switchbox from sparking, replace the Switchbox.

### 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 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.


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## MAXIMUM OUTPUT TEST:

1. Install an ammeter capable of reading at least 16 Amps between the Red wire and the starter solenoid battery post.
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 4500 RPM in gear.
4. Turn on the load bank switches to increase the battery load to equal 16 Amps.
5. Check the ammeter.
6. If the amperage is low,
   a) Check the load bank connections and meter for battery draw.
   b) If the output is still low, check and clean all connections between the battery and the Voltage Regulator. Inspect the Stator windings for burned or discolored windings.
7. If the amperage is correct, but the battery voltage remains low, replace the battery.

## 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 Gray 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.


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