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: 174-5456

This unit replaces the following P/N's: 398-5454A2, A6, A7, A8, A9, A17, A18, and A55.

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.

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 high voltage coils or bubbling around the battery charge windings indicate a bad Stator. Check for burn marks on each pole. If a problem is found on the battery windings, we recommend the Rectifier be closely checked. To replace Stators with ring terminals, use the bullet to ring adapters enclosed with this Stator.

INSTALLATION

1. Disconnect the Negative battery cable.
2. Disconnect the Stator wires from the Switchbox, engine ground, and the Regulator/Rectifier.
3. Remove the flywheel.
4. Mark the position of the mounting screws in relation to where the Stator wires come out of the old Stator.
5. Remove the old Stator.
6. Orient and install the new Stator in the same position as the old Stator on the engine and install the flywheel, following the service manual instructions.
7. Connect the Yellow Stator leads to the Regulator/Rectifier.
8. Connect the Stator Black wire to engine ground.
9. Connect the Red and Blue wire to one Switchbox and connect the Red/White and Blue/White wires to the other Switchbox.
10. Replace the flywheel according to the service manual.
11. Connect the Negative battery cable.

TROUBLESHOOTING

How to test the Engine Stop Circuit (Kill) for DC Voltage:

1. DC voltage present on the kill circuit of the Switchboxes due to a faulty key switch, boat harness, or engine harness will severely damage the Switchboxes internal kill circuit**.** Connect a Digital Multi Meter to the Ignition Stop wire(s) AT THE SWITCHBOXES while disconnected from the Switchboxes 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 Switchboxes at any point until the problem is corrected **OR DAMAGE TO THE SWITCHBOXES WILL OCCUR**!

NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow (or Orange) stop wires AT THE SWITCHBOXES 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).
2. Disconnect the Yellow wires from the Stator to the Regulator/Rectifier and retest. If the engine has spark, replace the Regulator/Rectifier.
3. Check the cranking RPM. A low cranking speed may 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. Inspect and clean all engine and Ignition ground connections.

NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. If two cylinders on separate Switchboxes are not sparking, check the Trigger as described in step 3 below. The Trigger has three pickup coils to Trigger six cylinders. #1 and #4, #2 and #5, #3 and #6 each share a Trigger coil.
2. Connect a spark gap tester and verify which cylinders are misfiring. If the cylinders are only misfiring above an idle, connect an inductive Tachometer to all cylinders and try to isolate the problem cylinders.

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3. Check the resistance and DVA of the Stator and Trigger as follows:

Read from	Read to	OEM Ohms	CDI Ohms	DVA (Connected)
Blue (Low speed Coil)	Engine Gnd	5.0-7.0K Ω	2-2.4K Ω	180 V Minimum
Blue/White (Low speed Coil)	Engine Gnd	5.0-7.0K Ω	2-2.4K Ω	180 V Minimum
Red (High speed Coil)	Engine Gnd	90-200 Ω	27-55 Ω	20 V Minimum
Red/White (High speed Coil)	Engine Gnd	90-200 Ω	27-55 Ω	20 V Minimum
Brown (#1 Trigger) (a)	White (#4 Trigger) (b)	0.8-1.4K Ω	0.8-1.4K Ω	4 V Minimum
White (#3 Trigger) (a)	Purple (#6 Trigger) (b)	0.8-1.4K Ω	0.8-1.4K Ω	4 V Minimum
Purple (#5 Trigger) (a)	Brown (#2 Trigger) (b)	0.8-1.4K Ω	0.8-1.4K Ω	4 V Minimum
Brown (#1 Trigger) (a)	Engine Gnd	Open	Open	1 V Minimum
White (#3 Trigger) (a)	Engine Gnd	Open	Open	1 V Minimum
Purple (#5 Trigger) (a)	Engine Gnd	Open	Open	1 V Minimum
Brown (#2 Trigger) (b)	Engine Gnd	Open	Open	1 V Minimum
White (#4 Trigger) (b)	Engine Gnd	Open	Open	1 V Minimum
Purple (#6 Trigger) (b)	Engine Gnd	Open	Open	1 V Minimum

(a) Black Band- Inside Switchbox (Engines using studded Switchboxes)
(b) Yellow Band- Outside Switchbox (Engines using studded Switchboxes)

4. Check the DVA on the Green wires from the Switchbox while connected to the Ignition coils. Check the reading on the Switchbox terminal AND on the Ignition coil terminal. You should have a reading of at least 150 V Minimum at both terminals. If the reading is low on one cylinder, disconnect the Green wire from the Ignition coil for that cylinder and reconnect it to a Pack Load resistor. Retest. If the reading is now good, the Ignition Coil is likely bad. A continued low reading symptom indicates a bad Switchbox.

NO SPARK ON ONE BANK (ODD OR EVEN CYLINDERS ON INLINE 6 CYLINDER):

1. Check the resistance and DVA of the Stator as follows:

Read from	Read to	OEM Ohms	CDI Ohms	DVA (Connected)
Blue (Low speed Coil)	Engine Gnd	5-7K Ω	2-2.4K Ω	180 V Minimum
Blue/White (Low speed Coil)	Engine Gnd	5-7K Ω	2-2.4K Ω	180 V Minimum
Red (High speed Coil)	Engine Gnd	90-200 Ω	27-55 Ω	20 V Minimum
Red/White (High speed Coil)	Engine Gnd	90-200 Ω	27-55 Ω	20 V Minimum

2. Swap both sets of the Stator wires between the Switchboxes. If the problem moves, replace the Stator.
3. If the problem stays on the same bank, swap physical location and all connections of the two Switchboxes. If the problem stays with one Switchbox, replace the Switchbox. If the Switchbox is bad, it is recommended that BOTH Switchboxes be replaced AS A SET.

ALL CYLINDERS HAVE SPARK BUT THE ENGINE WILL NOT RUN:

1. Check Ignition Timing for #1 Cylinder. Remember the Yellow banded leads go to cylinders 2, 4 & 6. and the Black banded leads go to cylinders 1, 3, and 5. The Green Coil Primary leads could be swapped.
2. Index the flywheel for all cylinders. ALL Cylinders should have approximately the same Ignition timing offset as # 1 Cylinder.
3. Check the Resistance on each Switchbox's White/Black wire, referenced to engine ground while disconnected. You should read 13-15 K Ω on each Switchbox. If there is over a 10% variance between the two Switchboxes, replace BOTH Switchboxes as a set.
4. Check Ignition Timing on ***all*** cylinders. If the Ignition Timing varies, replace *both of the Switchboxes as a set*.

SWITCHBOX OR TRIGGER REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the Trigger wires for shorts to engine ground as a shorted Trigger wire can destroy a SCR inside the Switchbox.
2. In contrast, a shorted SCR inside the Switchbox can destroy a Trigger coil. Check the Trigger resistance and DVA (see **NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS**).
3. Replace the Ignition coil on the cylinder dropping spark.

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(s) 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. Repeat the test as necessary for any additional Switchboxes.

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WILL NOT ACCELERATE BEYOND 3000-4000 RPM:

1. Disconnect the Yellow wires from the Stator to the Regulator/Rectifier and retest. If the engine now has good spark, replace the Regulator/Rectifier.
2. Connect a DVA meter between the Stator's Blue wire and engine ground. Run the engine up to the RPM where the problem is occurring. The DVA should increase with RPM. A sharp drop in DVA right before the problem occurs usually indicates a bad Stator.
3. Connect a DVA meter between the Stator's Red wire and engine ground. The DVA should show a smooth climb in voltage and remain high through the RPM range. A reading lower than on the Blue wire reading indicates a bad Stator.
4. Connect an inductive tachometer to each cylinder in turn and try to isolate the problem. A single cylinder dropping spark will likely be a bad Switchbox or Ignition coil. All cylinders not sparking properly usually indicates a bad Stator.
5. 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 because the water will evaporate off the spark plug before you can identify it.
6. Check the Trigger and Stator coil flywheel magnets for cracked, broken, or loose magnets.

MISS AT ANY RPM:

1. Disconnect the Yellow wires from the Stator to the Regulator/Rectifier and retest. If the miss clears up, replace the Regulator/Rectifier.
2. In the water or on a Dynamometer, check the DVA on the Green wires from the Switchbox 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 Switchbox or Trigger.
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 Switchbox or Ignition coil. Occasionally, a Trigger will cause this same problem. Check the Trigger DVA (see **NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS**).
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 because the water will evaporate off the spark plug before you can identify it.
5. Check the Trigger and Stator coil flywheel magnets for cracked, broken, or loose magnets.
6. 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.

WILL NOT IDLE BELOW 1500 RPM:

1. Check the Bias resistance from the Black/White **terminal** (wire disconnected) on the Switchbox to engine ground. Reading should be 13-15K Ω.
2. Check the Stator and Trigger Resistance and DVA (see **NO SPARK ON ANY CYLINDER**).
3. Check for air leaks.

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 Regulator/Rectifier. #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 Rectifier/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/Rectifier 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).

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7. Measure the DVA across the Stator's Yellow battery charge wires, while connected to the Regulator/Rectifier. At idle the DVA will normally between 8-25 DVA. If not, disconnect the Yellow wires from the Regulator/Rectifier 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.

MAXIMUM OUTPUT TEST:

1. Install an ammeter capable of reading at least 9 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 9 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 Regulator/Rectifier. 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 Regulator/Rectifier. At idle the DVA will normally be between 8-25 DVA. If not, disconnect the Yellow wires from the Regulator/Rectifier and retest. DVA will normally be 17-50 DVA at idle. If the voltage is now within specification, the Regulator/Rectifier is likely defective.
2. Disconnect the Regulator's Gray wire. At 800-1,000 RPM, check the DVA on the Gray wire FROM THE REGULATOR/RECTIFIER measured to engine ground. The reading should be 8 DVA or more. If not, replace the Regulator/Rectifier.
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.

OVERCHARGING:

1. Clean all battery terminals, cables, and mounting bosses.
2. Check the voltage on the battery with a multi-meter and compare it to the dash meter.
3. Compare the voltage at the Regulator/Rectifier with the voltage at the battery. If the voltage is ok at the Regulator/Rectifier and not good at the battery, you have a bad connection somewhere. Clean the battery posts and terminals.
4. Replace the battery with a known good Maintenance type flooded wet lead acid marine battery. If the battery voltage remains ok, install a new Maintenance type flooded wet lead acid battery.

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