



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: 174-0002

This unit replaces the following P/N's: 398-858404T 3, and 398-858404T 4.

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.

INSTALLATION

1. Disconnect the Negative battery cable.
2. Remove the flywheel according to the service manual for your engine.
3. Disconnect the old Stator's two wire connector to the CDM harness and from the Voltage Regulators.
4. Note the position of the mounting bolts in relation to where the Stator wires come out of the old Stator.
5. Remove the old Stator.
6. Mount 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.
7. Install the flywheel according to the service manual for your engine.
8. Connect the Stator's two wire connector to the CDM harness and the two wire connectors to the two Voltage Regulators. The Yellow wire pairs do not go in any particular orientation in relation to the Voltage Regulators.

TROUBLESHOOTING

NO SPARK ON ANY CYLINDER:

1. Perform a visual inspection of the Stator and Trigger wiring to the CDI Modules. Check to make sure that the wiring is correct, clean, and free of corrosion, and that all connections are tight.
2. Check the cranking RPM. A cranking speed less than 250 RPM will not allow the system to fire properly. This can be caused by a weak battery, dragging starter, bad battery cables, or a mechanical problem inside the engine.
3. Disconnect the Yellow wires from the Stator to the Voltage Regulators and retest. If the miss clears, connect the Stator wires back to the Voltage Regulator one at a time until the ignition system quits sparking. The Voltage Regulator you connected to the Stator that made the ignition system quit sparking is faulty and needs to be replaced.
4. Disconnect the Timing Protection Module's (TPM) 6 pin connectors from the Trigger and CDM Harness. Connect the Trigger directly to the CDM Harness, bypassing the TPM. Check for Spark. If Spark is present, check the Purple wire to the TPM. With the key switch on, you should have battery voltage present (above 10 V while cranking). If the voltage is not present, trace the Purple wire back to the key switch and locate the break in the wire.

Note: Remember, the TPM for the Carbureted engines has a built in RPM Limiter but the one for the Fuel Injected engines does not.

5. If the spark does not return, check the Stator and Trigger as shown:

Read from	Read to	OEM Ohms	CDI Ohms	DVA (Connected)	DVA (Disconnected)
White/Green (Stator)	Green/White (Stator)	380-430 Ω	380-430 Ω	160-400 V	200-400 V
Purple (#1 Trigger)	Blue (#4 Trigger)	1.1-1.4K Ω	0.85-1.05K Ω	0.4 V Minimum	4 V Minimum
White (#2 Trigger)	Red (#5 Trigger)	1.1-1.4K Ω	0.85-1.05K Ω	0.4 V Minimum	4 V Minimum
Brown (#3 Trigger)	Yellow (#6 Trigger)	1.1-1.4K Ω	0.85-1.05K Ω	0.4 V Minimum	4 V Minimum
Purple (#1 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-
White (#2 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-
Brown (#3 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-
Blue (#4 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-
Red (#5 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-
Yellow (#6 Trigger)	Engine Gnd	Open	Open	0.2 V Minimum	-

6. Disconnect the CDM modules one at a time and see if you get spark back on the other cylinders. A shorted stop circuit in one CDM can prevent ALL cylinders from sparking.
7. Disconnect the boat side harness and check for spark. If spark returns, check the key switch, emergency kill switch, and boat side harness.
8. Disconnect the Yellow wires from the Regulator/Rectifier and retest. If the engine has spark, replace the Regulator/Rectifier.
9. Check the cranking RPM. A cranking speed of less than 250 RPM 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.
10. Inspect the spark plug wires, boots, and spark plugs. Check for chafing on the wiring and harnesses.

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11. Inspect and clean all engine and ignition ground connections. Tug on the ground wires for the CDM Modules against the ring terminal. If the insulation stretches, the wire is broken internally. Replace the original 3 wire ring terminal with individual ring terminals (Solder them on if possible) and add a secondary ground wire (10 or 12 AWG) from the ground point of the CDM Modules and route it around and connect it with the Negative Black Ground Battery cable on the engine.
12. Pull on each wire from each CDM harness plug. Make sure all wires are making proper contact inside plugs.
13. Check the Trigger and Stator coil flywheel magnets for cracked, broken, or loose magnets.

NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Inspect the spark plug wires, boots and spark plugs. Check for chafing on the wiring and harnesses.
2. Clean and inspect CDM ground wire connections to engine ground.
3. Check the Trigger resistance and DVA (see **NO SPARK ON ANY CYLINDER**).
4. Disconnect the CDM modules one at a time and see if you get spark back on the problem cylinders. If it does, replace all defective CDMs.
5. If the cylinders are only misfiring above an idle, connect an inductive RPM meter to all cylinders and try to isolate the problem cylinders.
6. Check the resistance and diodes of each of the CDM modules as follows:

	Red Meter Lead	Black Meter Lead	OEM Reading	CDI Reading
CDM Pin #	(A) Ground	(C) Trigger	1.2-1.4K Ω	1.2-1.4K Ω
CDM Pin #	(D) Stator	(A) Ground	Open*	Open*
CDM Pin #	(A) Ground	(D) Stator	Reading*	Reading*
CDM Pin #	(D) Stator	(B) Kill Circuit	Reading*	Reading*
CDM Pin #	(B) Kill Circuit	(D) Stator	Open*	Open*
CDM Pin #	(A) Ground	(B) Kill Circuit	Reading*	Reading*
CDM Pin #	(B) Kill Circuit	(A) Ground	High M Ω or Open*	High M Ω or Open*
-	High Tension Lead	(A) Ground	0.7-1.3K Ω	2.2-2.4K Ω

** This Measurement is with the meter set to the diode scale. Where you see the term "Reading" represents a reading on the meter. Where you see the term "Open" represents no value showing on the meter.*

7. Check the two ground connections for the CDM Modules. Each will have 3 Black wires in a single ring terminal located on the CDM Module mounting plate. Check the resistance of the Black wire in the 4 pin connector to the CDM in reference to a good clean engine ground. It should show a short, less than 0.5 Ω. A high reading or an open reading indicates a break in the Black wire. Firmly pull on the Black ground wires against the ring terminal. If the wire comes out or the terminal seems loose inside the sleeve, replace the single terminal with individual ring terminals. Remove the old ring terminal and clean the mounting area for the ring terminals. Bolt the new ring terminal in place using the original mounting bolt. When the repair is complete, cover the exposed ring terminals with a protective coating like liquid electrical tape or neoprene.
8. If the cylinders are only acting up above an idle, connect an inductive Tachometer to all cylinders and try to isolate the problem cylinders.

CDM 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 CDM Module.
2. In contrast, a shorted SCR inside the CDM Module can destroy a Trigger coil. Check the Trigger resistance and DVA (see **NO SPARK ON ANY CYLINDER**).
3. Disconnect the 4 pin connector from the CDM Module with no spark. Check for DC voltage on the Black/Yellow in the 4 pin connector, reference to engine ground. Turn the ignition switch on and off several times. DC voltage should never exceed 2 VDC. If it does, the stop circuit has a fault. Check the key switch, harness, and shift switch for DC voltage bleeds to the kill circuit wire.
4. Verify that the ground connection for that CDM Module is in good condition.
5. Replace the CDM Module on the cylinder dropping spark.

MISS AT ANY RPM:

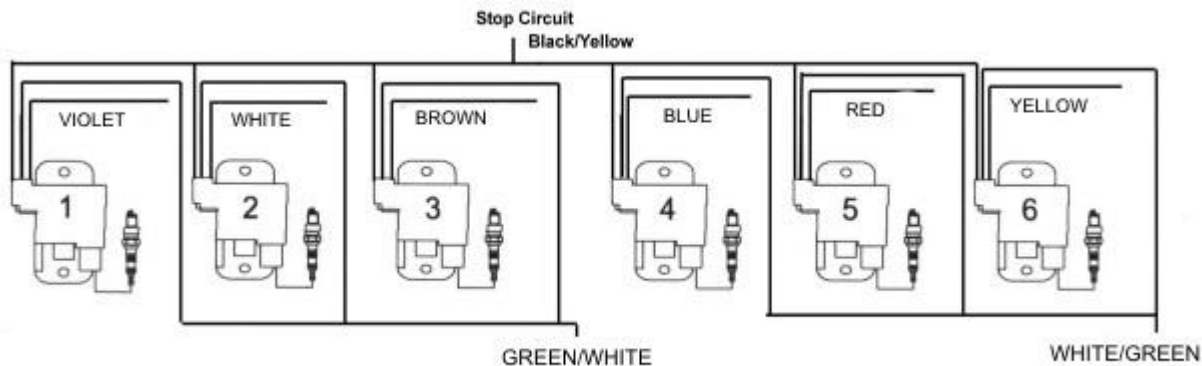
1. Disconnect the Yellow wires from the Stator to the Voltage Regulators and retest. If the miss clears, connect the Stator wires back to the Voltage Regulator one at a time until the miss comes back. The Voltage Regulator you connected to the Stator that made the miss come back is faulty and needs to be replaced.
2. 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 Trigger or CDM Module. Check the Trigger DVA (see **NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS**).
3. Perform a high speed shutdown and check the spark plugs 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.
4. Check the Trigger and Charge coil flywheel magnets for cracked, broken, or loose magnets.

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- Index the flywheel and check the timing on ALL cylinders. On carbureted models, the TPM Module Rev limiter function starts to retard timing in sequence (2, 3, 4, 5, 6, 1) at 5800-6000 RPM. The TPM Module will retard the timing on each cylinder up to 30° (starting with #2) and then stop firing that cylinder if the RPM is still above the limit. It will continue to retard and shut down cylinders until the engine drops below the limit.

NO SPARK OR INTERMITTENT SPARK ON #1, #2, and #3 OR #4, #5, and #6 CYLINDERS:

- Check the cranking RPM. A cranking speed less than 250 RPM may not allow the system to spark properly.
- Disconnect the CDM modules one at a time and see if you get spark back on the problem cylinders. If you do, the CDM Module you unplugged is faulty.
- Check the Stator and Trigger resistance and DVA (see **NO SPARK ON ANY CYLINDER**).
- If (#1, #2, and #3) or (#4, #5, and #6) is not sparking, swap the White/Green and Green/White Stator wires and retest. If the problem moves to the other cylinders, the Stator is likely faulty. If no change, bench test all of the CDM Modules. A continued no spark condition on the same cylinders indicates a bad Trigger.
- The connection guide below will assist you in locating areas where problems can occur. Remember, a short in either #1, #2 or #3 can cause either #4, #5 or #6 not to have spark.



ENGINE HAS ERRATIC TIMING OR ADVANCED TIMING:

- Check the Trigger magnet in the flywheel to see if it is loose, cracked, or broken.
- Disconnect the 4 wire TPM Module connector and check the DVA on the Black/White wire in reference to engine ground. You should read 25-40 DVA. If the voltage is low, replace the TPM Module.
- Replace the TPM Controller.

ENGINE HARD TO SHIFT INTO OR OUT OF GEAR:

- Check the Bias circuit DVA by performing a DVA test on the Black/White wire in reference to engine ground. You should read 25-40 DVA. If the voltage is low, replace the TPM Module.

ENGINE MISFIRES OVER 2000 RPM:

- Test the DVA from the Stator and Trigger while connected to the CDM Modules.
 - Check the DVA on the Green/White or White/Green wire in reference to engine ground while running the engine at the Rpm the misfire occurs. You should have 160-320 DVA on the Green/White or White/Green stator lead. If the voltage is low, check the Stator resistance. If it is high, check the CDM Module and ground connections.
 - The Trigger should read 2-8 DVA. If the voltage is low, check the Trigger resistance. If it is high, check the CDM and ground connections.

Note: If the Stator reads low on three cylinders and they share the same Stator wire color, swap the Stator wires and retest. If the problem moves, replace the Stator. If the problem stays on the same CDM Modules, one of the CDI Modules is defective.

- Check the Bias circuit DVA by performing a DVA test on the Black/White wire in reference to engine ground. You should read 25-40 DVA. If the voltage is low, replace the TPM Module.



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ENGINE DOUBLE FIRING:

1. Check the two ground connections for the CDM Modules. Each will have 3 Black wires in a single ring terminal located on the CDM Module mounting plate. Check the resistance of the Black wire in the 4 pin connector to the CDM in reference to a good clean engine ground. It should show a short, less than 0.5 Ω . A high reading or an open reading indicates a break in the Black wire. Firmly pull on the Black ground wires against the ring terminal. If the wire comes out or the terminal seems loose inside the sleeve, replace the single terminal with individual ring terminals. Remove the old ring terminal and clean the mounting area for the ring terminals. Bolt the new ring terminal in place using the original mounting bolt. When the repair is complete, cover the exposed ring terminals with a protective coating like liquid electrical tape or neoprene.
2. Check the Bias circuit DVA by performing a DVA test on the Black/White wire in reference to engine ground. You should read 25-40 DVA. If the voltage is low, replace the TPM Module.
3. Swap the CDM Module that is double firing with another CDM firing cleanly. If the problem moves, replace the defective CDM Module.

FUEL INJECTORS NOT ACTIVATING (EFI MODELS ONLY):

1. Check the DVA on the Green, Green/White, and Green/Red wires in reference to engine ground at cranking speed. You should have a reading of 8 V minimum. If the voltage is low, check the key on DC voltage on the Purple wire going to the TPM Module. You should read 10 VDC minimum while cranking the engine.
2. Check the DC voltage going to the fuel injectors. You should read 10 VDC minimum while cranking the engine.
3. Check the DVA across the fuel injectors. If you see approximately 25-60 DVA across the injectors, that means the injectors are pulsing correctly. If not, there could be a problem with the Injectors, the ECU, or the injector harness.

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 Regulators. #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 Regulators 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 wire pairs, while connected to the Voltage Regulators. At idle the DVA will normally between 8-25 DVA. If not, disconnect the Yellow wires from the Voltage Regulators 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 wire pairs, while connected to the Voltage Regulators. At idle the DVA will normally be between 8-25 DVA. If not, disconnect the Yellow wires from the Voltage Regulators and retest. DVA will normally be 17-50 DVA at idle. If the voltage is now within specification, the Voltage Regulators are 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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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 Voltage Regulators with the voltage at the battery. If the voltage is ok at the Voltage Regulators 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.