Introduction

The information contained in this Troubleshooting Guide has been compiled from various sources within the marine industry. Any reference to a specific product or brand is not intended for commercial purposes. References to test equipment and products are based upon the information available to the staff of CDI Electronics. **This information is designed for use as a reference guide by a professional marine technician.** CDI Electronics cannot be held liable for the misuse or abuse of the information contained herein. The staff tries to make the information as accurate as possible. However, CDI Electronics cannot assume responsibility for either the data accuracy or the consequences of the data's application.

Safety Issues

Always remember to treat the outboard engine with respect. The engine uses high voltage for ignition and contains several moving components. Always be aware of moving mechanical parts, the surrounding area, and the position of your hands and body near the engine.

- **Never touch electrical components with wet hands.**
- **Whenever the power source is not needed, disconnect the cable from the negative terminal.**
- **Never reverse the battery leads when you connect the battery or disconnect the terminals while the engine is running.**
- **Never touch high-tension leads (spark plug leads) with any ungrounded tools while the engine is running.**
- **Never install equipment with requirements exceeding the generating power of the engine. Reference the service manual for values.**
- **Attempt to protect the electronic components from water.**
- **Insure fuel lines, harnesses, and oil lines are properly routed. Failure to follow this rule could result in a fire hazard.**
- **Make sure all ground leads are clean and tight.**

Recommended Marine Shop Electrical Test Equipment and Tools

The following is a listing of tools available from CDI Electronics and recommended for testing late model engines:

Part Number	Description	Remarks/Use
511-9764	Neon Spark Tester	Sealed single cylinder has removable ground clamp can be used for running tests
511-9766	Sealed Spark Gap Tester	Allows for testing up to 8 cylinder for cranking tests. Sealed design reduces the chance of engine fire.
511-9770	Piercing Probes	Allows access to wires for testing without removing the connection. Tiny hole usually reseals itself.
511-9773 .	DVA (Peak Voltage)Adapter	Unit automatically compensates for polarity. Can be used with most quality Multimeters
511-9775	Load Resistor	Used to load the output of ignition modules when testing ignition coils.
518-33A	CDI 33 Meter Includes 511-9773 DVA Adapter	Meter has voltage, amperage, diode check and ohms DVA Adapter allows meter to read peak voltage
518-80TK	Fluke Temperature Adapter	Works with most digital Multimeters capable of reading millivolts.
520-ST80	DC Inductive Timing Light	DC Powered timing light with a very bright strobe light.
551-33GF	Gearcase Filler w/Check Valve	Universal design makes filling lower units easier. Check valve assembly helps prevent oil spills and makes filling easier.
551-34PV	Pressure/Vacuum Tester	Repairable metal combination unit does both vacuum and pressure testing.
551-5110	Flywheel Holder	Longer handle helps during use.
551-9765	Spark Plug Wire Puller	Grounded design reduces the chances of shocking.
553-2700	Amphenol Pin Tool Set	Set contains 1 each of 553-2697 (Insertion), 553-2698 (Pin Removal) and 553-2699 (Socket Removal)
553-9702	Sensor Gap Gauge Tool	Used to set the timer-base air gap on 1973-1978 OMC 3 and 4 cylinder engines with screw terminal power packs.
554-9706	Amp Pin Removal Tool	Used to remove the connector pins in the ignition system on Chrysler/Force engines using the Prestolite type ignitions. Also used on the Mercury TPI sensor connectors.
911-9783	Bullet Connector Kit	Contains 10 pieces each of the male, female and sleeves.
912-9708	Marine Terminal Kit	Contains 100+ pieces of hard to find terminals and heat shrink.
991-9705	Dielectric Grease	Use to keep water and corrosion out of connectors.
511-6996	Remote Starter For OMC	Used to replace the boat-side harness for engine testing, Fits most OMC engines 1969 to 2000.
511-7900	Remote Starter for Mercury	Used to replace the boat-side harness for engine testing, Fits most Mercury engines 1979 to 2000.
519-LB85	Load Bank	Used to load the battery when testing the battery charging output.

Optional Equipment

511-4017	OMC Optical Sensor Tester	Unique handheld tester that will efficiently test the optical ignition sensor.
511-0401	CDI 2 Cylinder Ignition Tester	New hand-held ignition tester generates high-voltage stator and low voltage trigger signals to test a variety of 2 cylinder ignition systems. Engine specific adapters are required. Includes 511-0402, 511-0403 and 511-0404 adapters.
520-ST84	Ferret Ultra Bright Timing Light	Ultra bright timing light is visible in bright sunlight. Also has a built-in tachometer for 2 and 4 stroke engines. This feature is a valuable diagnostic tool when troubleshooting ignition system problems.

Tricks to Testing with Minimal Test Equipment

All Engines

Please keep detailed records when you repair an engine. If an engine comes in with one cylinder not firing, mark which one on the work order/history.

Intermittent Firing: This problem can be very hard to isolate. A good inductive tachometer can be used to compare the RPM on all cylinders up through WOT (wide-open throttle). A significant difference in the RPM readings can help pinpoint a problem quickly.

Visually Check the Stator, Trigger, Rectifier/Regulator and Flywheel: Cracks, burned areas and bubbles in or on the components indicate a problem. If the battery charge windings on the stator are dark brown, black or burned on most or all of the posts, the rectifier/regulator is likely shorted as well. Any sign of rubbing on the outside of the stator indicates a problem in the upper or lower main bearings. A cracked trigger or outer charging magnets can cause many problems ranging from misfiring to no fire at all. Loose flywheel magnets can be dangerous, check the tightness of the bonding adhesive.

Rectifier/Regulators can cause problems ranging from a high-speed miss to a total shutdown. An easy check is to disconnect the stator leads to the rectifier (Make sure to insulate them) and retest. If the problem is gone – replace the rectifier/regulator.

Johnson/Evinrude

Open Timer Bases: When all cylinders fire with the spark plugs out, but will not with them installed, try re-gapping the sensors using P/N: 553-9702 Gap Gauge. (See the section on OMC ADI Ignitions page 22-24).

Engines with S.L.O.W. Features: If the customer is complaining that the engine won't rev up and shakes real bad, the S.L.O.W. function could be activating. If the engine is NOT overheating, a temperature sensor or VRO sensor failing early can cause this problem. Disconnect the TAN wires *at the power pack* and retest. If the engine performs normally, reconnect the tan wires one at a time until the problem recurs, then replace the last sensor you connected. Make sure that all of the TAN wires are located as far as possible from the spark plug wires. Also check the blocking diode in the engine harness.

Mercury 6 Cylinder Engines with ADI Ignitions

If more than one cylinder is not firing: Replace BOTH switch boxes unless you can pin the problem down to the trigger. Replacing just one switch box can result in damage to the engine if the remaining switch box on the engine has a problem in the bias circuit.

Always check the bias circuit: Disconnect the White/Black jumper between the switch boxes and check the resistance from the White/Black terminal on each switch box to engine ground. You should read 12-15,000 ohms on stock switch boxes, and 9,000-9,800 ohms on racing switch boxes. MAKE SURE THE READING IS THE SAME ON BOTH SWITCH BOXES! Any problem with the bias circuit and BOTH switch boxes must be replaced as a set.

No Fire on 1, 3, 5 or 2, 4, 6: Swap the stator leads from one switch box to the other. If the problem moves, replace the stator. If the problem remains on the same cylinders, replace the switch box. If the stator is replaced and the problem is still present, try another flywheel.

No Fire on One Cylinder: This can be caused by a defective blocking diode in the other switch box. Disconnect the White/Black jumper between the switch boxes and retest. If all cylinders are now firing, replace the switch box that was originally firing all three cylinders. To verify this condition, swap the trigger leads on the switch box that was originally firing all three cylinders. If the misfire moves to another cylinder, the switch box is bad.

Voltage Drop Measurement

Start by using a good digital auto-ranging voltmeter capable of reading 1/10th of a volt. The use of an auto-ranging meter will allow for more accurate testing without damaging the meter due to an incorrect range setting.

Remove the spark plug wires form the spark plugs and connect them to a spark gap tester and remove the emergency stop clip as well. This prevents the engine from starting and also reduces the chance of getting shocked by the ignition system.

The use of an ohmmeter to test a conductor or switch contact for their condition is not the best tool to use. In most cases, it is preferable to use a volt drop test to make sure the conductor, as well as the connection, is in good condition.

Before testing, remove and clean all battery cables and connection points.

Testing the Positive Battery Cable to the Engine

1. Select the DC Volts position on the meter.
2. Connect the Red (Positive) lead on the meter to the positive battery *POST*.
3. Connect the Black (Negative) lead on the meter to the starter solenoid terminal where the positive battery cable is connected.
4. Using a remote start switch, activate the starter solenoid to spin the engine and observe the reading on the meter. A reading above 0.6V indicates a bad cable or bad connection.
   (a) If the meter reads above 0.6V, move the Black lead on the meter to the positive battery cable terminal on the starter solenoid and retest. If the reading drops to below 0.6V, the cable connection is bad.
   (b) If the meter still reads above 0.6V, move the Black lead on the meter to the positive battery cable terminal on the battery and retest. If the reading drops to below 0.6V, the cable is bad or undersized.

Service Note: A bad power connection to the ignition or battery charging system can be found by connecting the Black lead on the meter to the power connection of the ignition system or charging system; then working your way back to the battery positive post. At no time should you see a reading above 1V.

Testing the Negative Battery Cable to the Engine

1. Select the DC Volts position on the meter.
2. Connect the Black (Negative) lead on the meter to the negative battery *POST*.
3. Connect the Red (Positive) lead on the meter to the engine block where the negative battery cable is connected.
4. Using a remote start switch, activate the starter solenoid to spin the engine and observe the reading on the meter. A reading above 0.6V is an indicator of a bad cable or bad connection.
   (a) If the meter reads above 0.6V, move the Red lead on the meter to the negative battery cable terminal on the engine block and retest. If the reading drops to below 0.6V, the cable connection is bad.
   (b) If the meter still reads above 0.6V, move the Red lead on the meter to the negative battery cable terminal on the battery and retest. If the reading drops to below 0.6V, the cable is bad or undersized.

A bad ground connection to the ignition and battery charging system can be found by connecting the Red lead on the meter to the ground connection of the ignition or battery charging system; then working your way back to the battery negative post. At no time should you see a reading above 1V.

Johnson/Evinrude Model to Year Identification for 1980 and newer Engines

"INTRODUCES"

I	N	T	R	O	D	U	C	E	S
1	2	3	4	5	6	7	8	9	0

Example: J150TTL<u>CE</u> would be a 1989 150 HP Johnson and aE175ST<u>EU</u> would be a 1997 175 HP Evinruide.

Engine Wiring Cross Reference Chart for Most Outboards

Circuit	Mercury PRE- 1978	Mercury 1978 & UP	OMC	Yamaha	Force PRE- 1994	Force 1994 & UP	Suzuki
Power	Red	Red	Red	Red	Red	Red/Purple	White
Ign Switch	White	Purple	Purple	Yellow	Blue	Red/Blue	Gray
Eng Gnd	Black	Black	Black	Black	Black	Black	Black
Kill Circuit	Orange Salmon White	Blk/Yellow	Blk/Yellow	White	White	Blk/Yellow	Green Red Blue
Eng Start	Yellow	Yellow/Red	Yellow/Red	Brown	Yellow	Yellow/Red	Brown Yellow/Red
Tach	Brown	Gray	Gray	Green	Purple	Gray	Yellow
Battery Charge	Yellow/Red	Yellow Yellow/Blk	Yellow Yellow/Gry	Green	Yellow	Yellow Yellow/Blk	Yellow/Red
Stator CDI Power	Red White Blue(a)	Blue Blue/White Red Red/White Green/Wht Wht/Green	Brown Brown/Yel Brown/Blk Brown/Wht	Blue Brown Red Blk/Red	Blue Yellow Brown/Blue Brown/Yel	Blue Blue/White Red Red/White Green/Wht Wht/Green	Green Black/Red
Choke	Gray Blue	Yellow/Blk	Purple/Wht	Blue	Green	Yellow/Blk	Orange
Overheat Eng Temp	Tan	Tan	Tan (b) White/Blk(c)	Pink	Orange	Tan	Green/Yel

(a) Ignition Driver systems only, all others were battery driven systems.
(b) The stripe color on the Tan wire indicates the temperature at which the sensor trips.
(c) The White/Black wire is the cold engine temp indicator and shorts to Gnd at approx 105 deg F.

Blk = Black Wht = White Gry = Gray
Yel = Yellow Blk = Black

ABYC Recommended Boat Wiring Color Codes		
Color	**Function**	**Comments**
Yellow/Red Stripe (YR)	Engine Start Circuit	
Brown/Yellow Stripe (BY)	Bilge Blower	Alternate color is Yellow (Y)
Yellow Stripe (Y)	Bilge Blower	If used for DC negative, blower MUST be Brown/Yellow Stripe.
Dark Gray (Gy)	Navigation Lights	Fuse or Switch to lights
Dark Gray (Gy)	Tachometer	
Brown (Br)	Generator/Alternator	Charge Indicator Lights, Fuse or switch to pumps.
Orange (O)	Accessory Power	Ammeter to alternator output and accessory fuse or switches. Distribution Panel accessory switch.
Purple (Pu)	Ignition Instrument power	Ignition switch to coil and electrical instruments , Distribution Panel to electric instruments.
Dark Blue	Cabin and instrument lights	Fuse or switch to lights.
Light Blue (Lt Bl)	Oil Pressure	Oil sender to gauge.
Tan	Water Pressure	Temperature sender to gauge.
Pink (Pk)	Fuel Gauge	Fuel sender to gauge.
Green/White Stripe	Tilt/Trim down or in	Tilt and Trim circuits
Blue/White Stripe	Tilt/Trim up or out	Tilt and Trim circuits

Chrysler Troubleshooting

Points Type Ignitions with Amplifiers (Power packs)

(Preamps are electronic replacements for points)

A large proportion of the problems with the battery CD units are caused by low battery voltage or bad ground connections. Low voltage symptoms are weak fire or erratic firing of cylinders. Maintenance free batteries are NOT recommended for this application.
WARNING!! Battery reversal will cause severe damage to the CD module and rectifier.

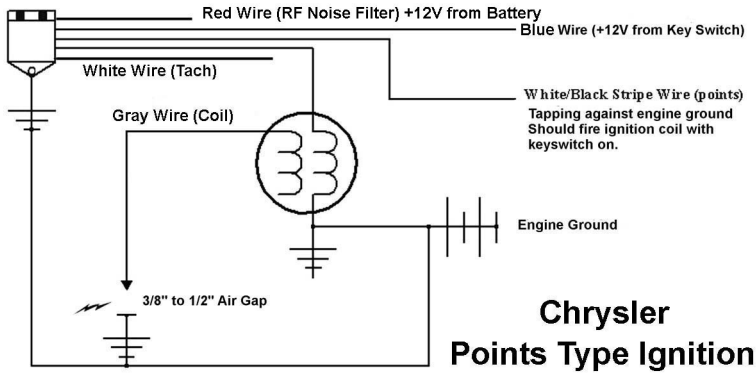
NOTE: The Chrysler CD modules are similar to the OMC CD modules with the exception of wire colors. The chart below will assist you as a general guideline for the Chrysler units:

Red	+12V from battery (RF Noise Filter)
Blue	+12V from the Key Switch
Gray	+ Terminal of ignition coil
White	OEM Tachometer signal
White/Black Stripe	Points or Preamp Module
Black	Engine ground

No Fire at All:

1. Clean all battery connections and engine grounds.
2. Make sure the CD module is grounded. Units using rubber shock mounts require a ground wire fastened from the pack to the engine block.
3. Connect a spark gap tester to the high tension lead coming from the ignition coil and set it to approximately ½". If it fires when you crank the engine over, there is a problem in the distributor cap, rotor button or spark plug wires.

Wiring Connection for Testing CD Module



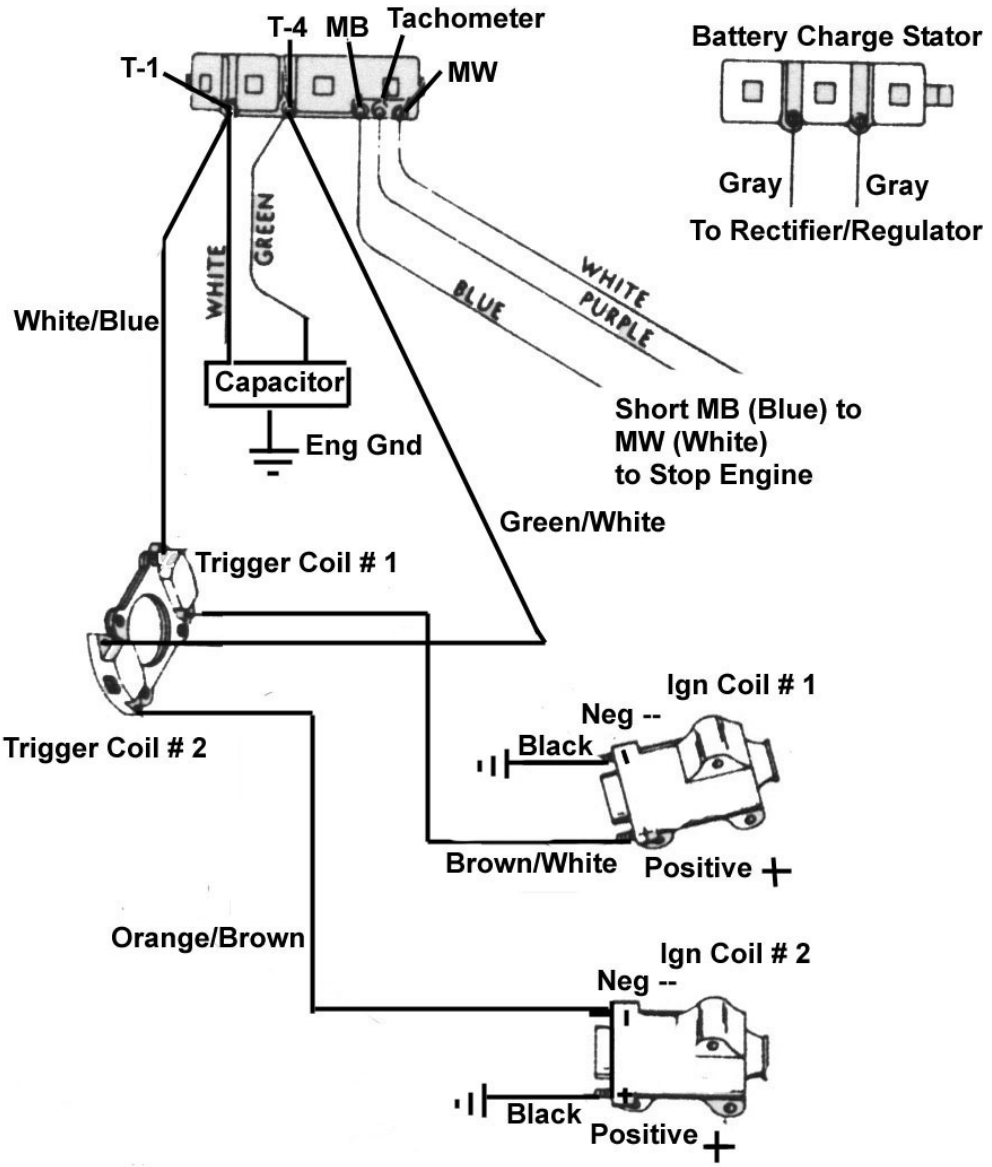
NOTE: Preamps are an electronic version of points and the ignition module will test the same for both.

4. Check voltage present on the blue wire at cranking. It MUST be at least 9½ volts. If not, the problem is likely in the harness, key switch, starter or battery.
5. Connect a DC voltmeter to the white/black wire (while it is connected to the distributor) and rotate the engine. There should be some fluctuation in the meter reading. If the reading is high, and fails to move up and down, there is definitely a problem inside the distributor. If the reading is low, disconnect the white/black wire from the distributor and with the key switch turned on, strike the white/black wire against engine ground. The unit should fire each time. If it does, then the CD module is usually good and the points (or Preamp) require checking. If the CD module fails to fire with this test, then the CD module is usually bad.
6. Check DVA voltage on the gray wire going to the coil, it should be approximately 200 volts at cranking. If the voltage is correct, replace the coil with another coil and retest or use a load resister if another coil is not available. A coil that is shorted internally will give a low reading. In this case replace the coil and retry.

After repairing the engine, check the battery voltage at approximately 3500 RPM, The MAXIMUM allowable voltage reading is 16 volts and the minimum is 12V. Running below 12V or over 16 volts will damage the ignition. Check for loose connections or a bad battery.

Magnapower II Systems

1. Disconnect the white and blue kill wires from the CD Module and retest. If the engine starts and runs, the key-switch or kill circuit is bad.
2. Connect a DC voltmeter from the kill wires to engine ground and turn the ignition switch on and off several times. At no time should you see battery voltage on the kill circuit.
3. Connect a spark gap tester to all cylinders and test with the spark plugs in and out. If the coils will not fire with the spark plugs in, check compression with the spark plugs removed from all cylinders. A blown head gasket on these engines can prevent the coils from firing with the spark plugs installed. This is caused by a hard to explain problem with the triggering circuit.
4. Crank the engine with the starter and then stop. Check the DVA voltage on terminals T1 and T4. You should read between 170 and 270 volts Positive on terminal T1 and between 170, and 270 volts Negative on terminal T4. (Remember that some DVA adapters are not polarized and will read the same regardless of the polarity). If there is a low reading on one of the terminals, disconnect the white/blue and green/white trigger wires, then retest. If the readings are now correct, one of the trigger modules is bad. A continued low reading may be caused by a bad capacitor. To test, use a couple of jumper wires and swap the green and white capacitor wires going to terminals T1 and T4. If the low reading remains on the same terminal, the CD is bad. If it moves when you move the capacitor wires, the capacitor is shorted.
5. Check to see if the ignition coils are wired correctly. The #1 coil on a two cylinder engine and the #1 & 2 cylinder on a four cylinder engine are wired as NEGATIVE GROUND. The #2 coil on a two cylinder engine and the #3 & 4 cylinder on a four cylinder engine are wired as POSITIVE GROUND.



Chrysler Troubleshooting

Capacitive Discharge Module with Alternator
(ADI – Alternator Driven Ignition)

General Troubleshooting

1. Disconnect the kill wires from the CD and connect a DC voltmeter between the kill wires and engine ground. Turn the ignition switch on and off several times. If, at any time, you see voltage appearing on the meter, there is a problem in the harness or ignition switch. At NO TIME SHOULD YOU SEE BATTERY VOLTAGE ON A KILL CIRCUIT.
2. Check the flywheel for a broken or loose magnet.
3. Check for broken wires and terminals, especially inside the plastic plug-in connectors. We recommend that you remove the pins from the connectors using the CDI **511-9706** pin removal tool and visually inspect them.
4. Visually inspect the stator for burned or discolored areas. If found, replace the stator. If the areas are on the battery charge windings, it indicates a possible problem with the rectifier.

IF NO FIRE ON ANY CYLINDER:

1. Disconnect all kill wires AT THE PACK.
2. Check for broken or bare wires on the unit, stator and trigger.
3. Using the CDI meter with the 511-9773 peak reading adapter, or CD-77 and 511-9770 piercing probes, measure DVA voltage of the stator between the output wire sets. With everything connected, reading's should be approximately 180 volts or more. Resistance readings between the stator wire sets range from 680 – 800 ohms (factory) and 400 – 500 (CDI/RAPAIR).
4. Disconnect the rectifier. If the engine fires, replace the rectifier.

NO FIRE OR INTERMITTENT ON ONE CYLINDER:

1. Check the stator resistance, you should read 680-800 ohms (factory) and 250-350 ohms (CDI/RAPAIR) DVA 180V or more from blue to yellow (Note – On some two cylinder engines, the stator has two blue wires and no yellow wire. The stator will read from blue to blue). All stator wires should read open to engine ground.
2. Check the trigger resistance, trigger wire sets read approximately 50 ohms between the wire sets (DVA-5V or more), and open to engine ground.
3. If readings are good, disconnect kill wire from one pack. If the dead cylinder starts firing, the problem is likely the blocking diode in the opposite pack.

NO FIRE ON TWO CYLINDERS:

If two cylinders from the same CD unit will not fire, the problem is usually in the stator. Test per above.

ENGINE WILL NOT KILL:

Check kill circuit in the pack by using a jumper wire connected to the kill wire coming out of the pack and shorting it to ground. If this kills the pack, the kill circuit in the harness or on the boat is bad, possibly the ignition switch.

COILS ONLY FIRE WITH THE SPARK PLUGS OUT:

Check for dragging starter or low battery causing slow cranking speed. DVA test stator and trigger.

HIGH SPEED MISS:

1. Using the CDI meter with the 511-9773 peak reading adapter, (or CD-77) and 511-9770 piercing probes, DVA check stator voltage to each pack at high speed. If it exceeds 400 volts, replace the pack.
2. Disconnect the rectifier. If the engine fires, replace the rectifier.

Two Cylinder Engines with Combination CD Module with Built-in Ignition Coils

NO FIRE OR INTERMITTENT ON ONE CYLINDER:

1. Check the stator resistance, you should read 680-800 ohms (factory) and 250-350 ohms (CDI/RAPAIR) DVA 180V or more from blue to yellow (Note – On some two cylinder engines, the stator has two blue wires and no yellow wire. The stator will read from blue to blue). All stator wires should read open to engine ground.
2. Check the trigger resistance, trigger wire sets read approximately 50 ohms between the wire sets (DVA-5V or more), and open to engine ground.
3. If readings are good, disconnect kill wire from one pack. If the dead cylinder starts firing, the problem is likely the blocking diode in the opposite pack.

ENGINE WILL NOT SHUT OFF:

Check kill circuit in the pack by using a jumper wire connected to the kill wire coming out of the pack and shorting it to ground. If this kills the pack, the kill circuit in the harness or on the boat is bad, the ignition switch could also be bad.

Chrysler/Force Troubleshooting

Prestolite Capacitive Discharge Module with Alternator
(ADI – Alternator Driven Ignition)

Two Cylinder Engines Using a Separate Switch Box and Ignition Coils

1. Disconnect the stop wires from the CD and connect a DC voltmeter between the stop wires and engine ground, turn the ignition switch on and off several times. If, at any time, you see voltage appearing on the meter, there is a problem in the harness or ignition switch. At NO TIME SHOULD YOU SEE BATTERY VOLTAGE ON A STOP CIRCUIT.
2. Check the flywheel for a broken or loose magnet.
3. Check for broken wires and terminals, especially inside the plastic plug-in connectors. We recommend that you remove the pins from the connectors using the CDI **511-9706** pin removal tool and visually inspect them.
4. Visually inspect stator for burned or discolored areas. If found, replace the stator. If the areas are on the battery charge windings, it indicates a possible problem with the rectifier.

IF NO FIRE ON EITHER CYLINDER:

1. Disconnect all stop wires AT THE PACK.
2. Check for broken or bare wires on the ignition module, stator and trigger.
3. Using the CDI meter with the 511-9773 peak reading adapter, or CD-77 and 511-9770 piercing probes, measure DVA voltage of the stator between the output wire sets. With everything connected, reading's should be approximately 180 volts or more. Resistance readings between the stator wire sets ranges from 680 – 800 ohms (factory) and 250-350 ohms (CDI/RAPAIR).
4. Disconnect the rectifier. If the engine now has spark, replace the rectifier.

NO SPARK OR INTERMITTENT ON ONE CYLINDER:

1. Check the stator resistance, you should read 680-800 ohms (factory) and 400 – 500 (CDI/RAPAIR) DVA 180V or more from blue to yellow (Note – On some two cylinder engines, the stator has two blue wires and no yellow wire. The stator will read from blue to blue). All stator wires should read open to engine ground.
2. Check the trigger resistance, trigger wire sets read approximately 50 ohms between the wire sets (DVA-5V or more), and open to engine ground.
3. If readings are good, disconnect stop wire from one pack. If the dead cylinder starts sparking, the problem is likely the blocking diode in the opposite pack.

ENGINE WILL NOT STOP:

Check the stop circuit in the pack by using a jumper wire connected to the white stop wire coming out of the pack and shorting it to the white stop wire coming out of the other pack. If this stops all spark from the pack, the stop circuit in the engine harness or on the boat is bad, the ignition switch could also be bad.

COILS ONLY HAS SPARK WITH THE SPARK PLUGS OUT:

Check for dragging starter or low battery causing slow cranking speed. DVA test stator and trigger.

HIGH SPEED MISS:

1. Using the CDI meter with the 511-9773 peak reading adapter, (or CD-77) and 511-9770 piercing probes, DVA check stator voltage to each pack at high speed. If it exceeds 400 volts, replace the pack.
2. Disconnect the rectifier. If the engine now has spark, replace the rectifier.

Three and Four Cylinder Engines Using Separate Switch Boxes and Ignition Coils

1. Check for broken wires and terminals, especially inside the plastic plug-in connectors. We recommend that you remove the pins from the connectors using the CDI **511-9706** pin removal tool and visually inspect them.
2. Check the flywheel for a broken or loose magnet.
3. Disconnect the stop wires from the CD and connect a DC voltmeter between the stop wires and engine ground, turn the ignition switch on and off several times. If, at any time, you see voltage appearing on the meter, there is a problem in the harness or ignition switch. At NO TIME SHOULD YOU SEE BATTERY VOLTAGE ON A STOP CIRCUIT.
4. Visually inspect stator for burned or discolored areas. If found, replace the stator. If the areas are on the battery charge windings, it indicates a possible problem with the rectifier.

IF NO SPARK ON ANY CYLINDER:

1. Disconnect stop wire AT THE PACK.
2. Check for broken or bare wires on the unit, stator and trigger.
3. Using the CDI meter with the 511-9773 peak reading adapter, or CD-77 and 511-9770 piercing probes, measure DVA voltage of the stator between the output wire sets. With everything connected, reading s should be approximately 180 volts or more. Resistance readings between the stator wire sets range from 680 – 800 ohms (factory) and 250-350 ohms (CDI/RAPAIR).
4. Disconnect the rectifier. If the engine has spark, replace the rectifier.

Chrysler/Force Troubleshooting

Capacitive Discharge Module with Alternator
(ADI – Alternator Driven Ignition)

Three and Four Cylinder Engines Using Separate Switch Boxes and Ignition Coils (Continued)

NO SPARK OR INTERMITTENT ON ONE CYLINDER:

1. Check the stator and trigger resistance; the trigger wire sets should read approximately 50 ohms between the wire sets (DVA-5V or more), the stator should read 680-800 ohms (factory) and 250-350 ohms (CDI/RAPAIR) DVA 180V or more from blue to yellow.
2. If readings are good, disconnect the stop wire from one pack. If the dead cylinder starts sparking, the problem is likely the blocking diode in the opposite pack.

NO SPARK ON TWO CYLINDERS:

If two cylinders from the same CD unit will not spark, the problem is usually in the stator. Test per above.

ENGINE WILL NOT SHUT OFF:

Check the stop circuit in the pack by using a jumper wire connected to the stop wire coming out of the pack and shorting it to ground. If this stops the pack from sparking, the stop circuit in the harness or on the boat is bad, the ignition switch could also be bad.

COILS ONLY HAS SPARK WITH THE SPARK PLUGS OUT:

Check for dragging starter or low battery causing slow cranking speed. DVA test stator and trigger.

HIGH SPEED MISS:

1. Using the Fluke meter with the 511-9773 peak reading adapter, (or CD-77) and 511-9770 piercing probes, DVA check stator voltage to each pack at high speed. If it exceeds 400 volts, replace the pack.
2. Disconnect the rectifier. If the engine now has spark, replace the rectifier.

Pack #1 (Firing #1 and #2 Cylinders)

Pack:	White/Orange Stripe	**Trigger:**	White/Orange Stripe
	White/Yellow		White/Yellow (a)
	White/Red		White/Red (a)
	White/Green Stripe		White/Green Stripe
Pack:	Brown/Yellow Stripe	**Stator:**	Brown/Yellow Stripe
	Brown/Blue Stripe		Brown/Blue Stripe
Pack:	Orange/Blue	**Coil:**	White
	Blue/Red		White

Pack #3 (Firing #4 and #5 Cylinders)

Pack:	White/Orange Stripe	**Trigger:**	White/Orange Stripe
	White/Yellow		White/Yellow (a)
	White/Red		White/Red (a)
	White/Green Stripe		White/Green Stripe
Pack:	Brown/Yellow Stripe	**Stator:**	Brown/Yellow Stripe
	Brown/Blue Stripe		Brown/Blue Stripe
Pack:	Orange/Blue	**Coil:**	White
	Blue/Red		White

P Pack #2 (Firing #3 Cylinder)

Pack:	White/Orange Stripe	**Trigger:**	White/Orange Stripe
	White/Yellow		White/Yellow (a)
	White/Red		No Connection
	White/Green Stripe		No Connection
Pack:	Brown/Yellow Stripe	**Stator:**	Brown/Yellow Stripe
	Brown/Blue		No Connection (must be connected to the blue terminal on pack 1)
Pack:	Orange/Blue	**Coil:**	White
	Blue/Red		No Connection

(a) CDI replacement triggers do not have a connection for this wire from the power pack as the new trigger uses a common ground wire. This allows the wires going to the power pack from the trigger to be larger and more durable. The power pack uses that color as a ground wire for the trigger.

Color Code Cross Reference

FUNCTION	OLD	NEW
Trigger	Orange	White/Orange Stripe
Trigger	Green	White/Yellow Stripe
Trigger	Red	White/Red Stripe White/Green Stripe
Trigger	White/Green Stripe	White/Green Stripe
Stator	Blue	Brown/Blue Stripe
Stator	Yellow	Brown/Yellow Stripe
Pack Output to Coil	Orange	Orange/Blue
Pack Output to Coil	Red	Blue/Red
Ignition Coil	White	Orange/Blue
Stop Circuit	White	Black/Yellow

CDI ELECTRONICS

(DVA) PEAK READING VOLTAGE AND RESISTANCE CHARTS

NOTICE: These charts were compiled using the CDI 511-9773 Peak Adapter with a shielded Digital Multimeter.

NOTE: The resistance readings are given for a room temperature of 68°F. Higher temperatures will cause a slightly higher resistance reading.
DVA readings should always be taken with everything hooked up with the exception of the kill circuit.

The CDI peak reading voltage adapter is specifically designed to work with shielded Digital Multimeters. This adapter will simplify the testing of electronic ignition systems, stators, sensors and charging systems. The DVA readings will be approximately the same as any other DVA meter and the specifications listed in the service manuals can be followed without problems (Hopefully a little easier to you).

The CDI piercing probe set (511-9770) and the pack load resister (511-9775) are highly recommended for use with this adapter.

INSTRUCTIONS

1. Plug the adapter into the shielded Digital Multimeter with the (+) rib side pin in the (V, Ohms) jack and the other pin in the (COM) jack.
2. Set the digital voltmeter to DC Volts (the purpose of the adapter is to convert and *store* the voltage so that it can be read by a meter).
3. Connect the probes to the component to be measured.

*NOTE: The adapter will **automatically compensate for polarity** and all readings will be peak voltage.*

See the following pages for readings of Chrysler, Force, Mercury, OMC (Johnson/Evinrude), OMC Sea Drive and Yamaha engines. Other ignitions can be tested using test results given by the manufacturer of the equipment or by comparing a known good system to a suspect one. Please forward any additional readings you would like to have included in future printings.

Chrysler

DVA (PEAK READING) and RESISTANCE CHARTS

		Model	Ignition	Stator	Stator	Stator	Trigger	Trigger	Trigger	Ignition Coil	
HP	Year	Type	Part		DVA	Reading		DVA	Reading	Primary	Output
			Number	Ohms	Output	Colors	Ohms	Output	Colors	Ohms	
7.5	1972	BOC/B1D /HOC/H1D	525475	680-850 300-400*	180V+	Blue - Blue	48-52	0.5V+	Orange to Grn Red to Wht/Grn	N/A	125-140
7.5	1977	BOC/B1C /HOC/H1C	525475	680-850 300-400*	180V+	Blue - Blue	48-52	0.5V+	Orange to Grn Red to Wht/Grn	N/A	125-140
7.5	1979- 1984	All Models	525475	680-850 300-400*	180V+	Blue - Blue	48-52	0.5V+	Orange to Grn Red to Wht/Grn	N/A	125-140
8	1982	82H8J -87H8A	525475	680-850 300-400*	180V+	Blue - Blue	48-52	0.5V+	Orange to Grn Red to Wht/Grn	N/A	125-140
9.9	1979- 1984	A, B	510301 116- 0301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
10	1976- 1978	W/CD & Alternator	510301 116- 0301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
12	1979	W/CD & Alternator	510301 116- 0301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
15	1976 - 1984	W/CD & Alternator	510301 116- 0301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
20	1979 - 1981	W/CD & Alternator	529301 116- 9301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
25	1983 - 1984	W/CD & Alternator	529301 116- 9301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
30	1979 - 1982	W/CD & Alternator	529301 116- 9301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
35	1978 - 1984	W/CD & Alternator	529301 116- 9301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
55	1977 - 1980	W/Magna-power II	474301- 1	Not Applicable	180V+	T1 & T4 to Eng Gnd	Open	0.5V+	Between Terminals	0.2-1.0	200- 2000
55	1981 - 1983	All Models	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
60	1984	All Models	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
65	1977 - 1978	W/Magna-power II	474301- 1	Not Applicable	180V+	T1 & T4 to Eng Gnd	Open	0.5V+	Between Terminals	0.2-1.0	200- 2000
80	1983 - 1984	W/CD & Alternator	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
90	1983 - 1984	W/CD & Alternator	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
105	1976	BD/BE/HA/HD/HE	474301- 1	Not Applicable	180V+	T1 & T4 to Eng Gnd	Open	0.5V+	Between Terminals	0.2-1.0	200- 2000
115	1983 - 1984	W/CD & Alternator	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
120	1976	BD/BE/HD/HE	474301- 1	Not Applicable	180V+	T1 & T4 to Eng Gnd	Open	0.5V+	Between Terminals	0.2-1.0	200- 2000
125	1981 - 1982	W/CD & Alternator	475301 116- 5301*	680-850 300-400*	180V+	Blue - Yellow	48-52	0.5V+	Orange to Grn Red to Wht/Grn	0.2-1.0	800- 1100
135	1976	BD/BE/ HD/HE	474301- 1	Not Applicable	180V+	T1 & T4 to Eng Gnd	Open	0.5V+	Between Terminals	0.2-1.0	200- 2000

Grn = Green

Wht/Grn = White/Green Stripe

* Indicates a part manufactured by CDI Electronics

Glossary of Terms

ADI – **Alternator Driven Ignition**, consists of a flywheel, stator, trigger and ignition module.

ADTC - **After Top Dead Center** Reference on ignition timing.

BTDC - **Before Top Dead Center** Reference on ignition timing.

CD Ignition – **Capacitive Discharge Ignition**. The capacitor stores the power developed by a stator or inverter and uses a SCR to deliver the power to the ignition coil.

CDM – **Capacitive Discharge Module**. The CDM is a combination of the switch box and ignition coil.

Crank - Refers to the engine being turned over with the starter, not running. Spark plug wires are usually connected to a spark gap tester.

DVA – **Direct Voltage Adapter**. Also known as Peak voltage. The term refers to the peak voltage as read by a specialized meter or a multimeter using a adapter to convert the peak voltage in the ignition system to a DC value. Regular meters cannot read the voltages due to the frequency and duration of the pulses in the system.

Power Pack – Term used by Johnson/Evinrude for the ignition module.

RPM – **Revolutions per minute**. The number of times the engine rotates in one minute.

S.L.O.W. – **Speed Limiting Oil Warning** system. Limits the RPM of the engine to approximately 2500 RPM in order to reduce the damage to the engine caused by a no oil or overheat condition.

Spark Tester - Device used to check for spark from the ignition coil to the spark plug. Testers are normally available in 1, 4, 6 and 8 cylinder configurations.

Switch Box – Term used for Force, Mariner and Mercury ignition modules.

W.O.T. – **Wide Open Throttle**.