



# 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 Technical Support at (800) 648-3976. Do not return to the Dealer or Distributor where the part was purchased. Contact Sierra Directly for Return Goods Authorization.

## SIERRA P/N: 18-99166

This unit replaces the following P/N's: 586015, 586098, and 586292.

This unit replaces CDI P/N: 113-6292

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

***This unit requires the Factory Recommended Champion QL78YC (0.30 Gap) Spark Plugs and the Gray or Blue spark plug wires (Order Part Number 18-8839-1 for a set of 4 wires).***

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

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

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

## INSTALLATION

1. Disconnect 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 Stator wire connector from the Power Pack.
4. Disconnect the harness wire connector from the Power Pack.
5. Disconnect the Optical sensor wire connector from the Optical sensor.
6. Disconnect the spark plug wires from the spark plugs.
7. Unbolt and remove the Ignition coils and old Power Pack. Look for burned areas between the coil mounting holes on the stainless RF shield. If a discoloration is found, replace that particular Ignition coil. Take care not to over-torque the mounting bolts, OEM specification calls for 50-95 in lbs. of torque.
8. Disconnect the Orange Primary wires of the old Power Pack from the Ignition coils and connect the Orange Primary wires of the new Power Pack to the Ignition coils. The Orange/Blue Primary wires are for cylinders 1 and 2, and the Orange/Green Primary wires are for cylinders 3 and 4.
9. Make sure the RF noise shield is between the Ignition coils and the Power Pack.
10. Connect the Stator and harness connectors to the Power Pack. Use a small amount of dielectric silicone grease on the connector seal but do not put any inside the sockets.
11. Connect the harness wire connector to the Power Pack.
12. Connect the Optical sensor connector to the Optical Sensor.
13. Replace the timing wheel cover, Power Pack cover, and Voltage Regulator cover.
14. Connect the spark plug wires to the spark plugs.
15. Reconnect the negative battery cable.

## 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 (if present).
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 (or Brown/White) (Stator) | 900-1200 $\Omega$ | 150-400 V       | 150-400 V (*)      |
| Orange (Power coil) | Orange/Black (Power coil)              | 50-60 $\Omega$    | 11-22 V         | 45-120 V (*)       |

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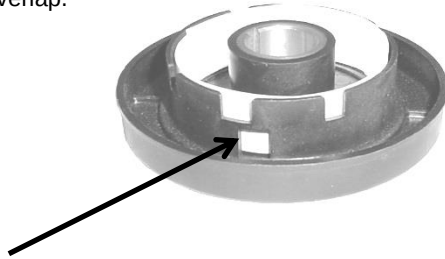
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5. Check the DVA on the Black/Yellow kill wire by back probing the connector of the Power Pack. You should have a reading of at least 150 DVA or more. The Stator and Optical Sensor plugs should be connected to the Power Pack for this test. If you do not, check the DVA on the Stator and the DC voltage on the Optical Sensor. If the DVA on the Stator and the DC voltage is good on the Optical Sensor but the DVA on the Black/Yellow Kill wire coming out of the Power Pack is low, the Power Pack is likely faulty.
5. Verify the engine is turning in a clockwise direction. If not, see **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/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) | SIE 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.

### 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 5 notches.
2. Check the ignition timing. Before Quick Start, it should be set to 4° BTDC. After Quick Start, it should be set to 6° ATDC.
3. If possible, try another Optical sensor.
4. If still no change, replace the Power Pack.

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### 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  $\Omega$  indicates a defective Ignition coil.
3. Check the resistance of the spark plug wire. Normally, you will read approximately 100  $\Omega$  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:

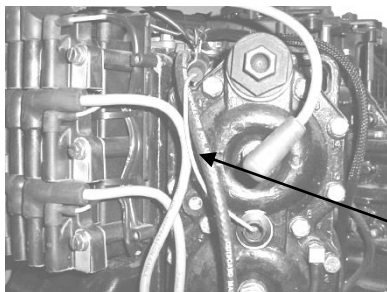
1. Verify the engine is spinning in a clockwise direction.
2. Check the Optical sensor to encoder wheel alignment. You may need to shim the Optical sensor upwards 0.020" to 0.0285" to make it engage the encoder wheel.

### 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.

### ENGINE WILL NOT ACCELERATE BEYOND 2500 RPM (Runs smooth below that RPM):

1. Verify the engine is not actually over heating by using a digital pyrometer.
2. Check the routing of the Tan temperature wires, an example of a bad location is shown below. The Tan wires have to be located as far away as possible from the spark plug wires.



Unacceptable routing for the temp wire (V6 engine shown).

3. Verify the engine is not overheating and disconnect the Tan temperature sensor wire. If the engine performs normally, check both temperature sensors and replace the defective one.

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4. If there is not any indication of a problem at this point, replace the Power Pack.

### ENGINE STAYS IN QUICK-START:

1. Check the Yellow/Red wire for DC voltage while the engine is running. You should only see voltage on this wire while the starter solenoid is engaged. A voltage reading of 5-7 VDC will not engage the starter solenoid but will engage Quick Start. Check the starter solenoid, harness, and ignition switch.
2. Short the White/Black temperature switch wire from the Power Pack to engine ground. Start the engine, if the Quick Start drops out after approximately 5 seconds, replace the White/Black temperature switch.
3. Disconnect the Black/White wire from the Power Pack. If the Quick Start feature is not now working, replace the Power Pack.

### ENGINE DIES WHEN QUICK-START DROPS OUT:

1. Check ignition timing at idle with the White/Black temperature wire disconnected. Remember to allow for the drop in ignition timing when Quick Start disengages. Verify ignition timing after engine has warmed up, according to the service manual.

### QUICKSTART DOES NOT WORK:

1. Check DVA from the Orange to the Orange/Black Power coil wires while connected to the Power Pack. The reading should be 8-24 DVA. A reading above 24 V indicates a problem in the Power Pack while a reading below 8 DVA usually indicates a problem in the Stator.

### WILL NOT RUN WHEN HOT:

1. Check the Stator resistance and DVA as given below:

| Read from           | Read to                               | Ohms              | DVA (Connected) | DVA (Disconnected) |
|---------------------|---------------------------------------|-------------------|-----------------|--------------------|
| Brown (Stator)      | Brown/ White (or Brown/Yellow) Stator | 900-1200 $\Omega$ | 150-400 V       | 150-400 V          |
| Orange (Power Coil) | Orange/Black (Power Coil)             | 50-60 $\Omega$    | 11-22 V         | 45-120 V           |

2. Test the Optical sensor while hot (Sierra P/N 18-99553 Optical Sensor Tester) or by using another Optical sensor for testing.