



## Johnson/Evinrude Alternator Driven CD Ignitions 1977-2006 Two Stroke/Except Direct Injected Engines Two Cylinder Engines 1977-2006 4-60 HP Models

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

### NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wire AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the engine has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550	150-400 V	150-400 V (*)
Brown	Engine GND	Open	150-400 V	< 2 V (c)
Brown/Yellow	Engine GND	Open	150-400 V	< 2 V (c)
Orange	Orange/Black	450-550 (CDI 45-55)	11-22 V	45-120 V (*)
Black/White	White/Black	15-50	0.6 V +	0.6 V + (#)
Black/White	Engine GND	Open	150-400 V (b)	< 2 V (c)
White/Black	Engine GND	Open	150-400 V (b)	< 2 V (c)

#### Some engines use the following wiring on the timer base:

White	Blue	25-30	100-400 V (a)	0.6 V + (#)
White	Green	25-30	100-400 V (a)	0.6 V + (#)
White	Engine GND	Open	N/A	N/A
Blue	Engine GND	Open	100-400 V (a)	N/A
Green	Engine GND	Open	100-400 V (a)	N/A

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) The trigger signal rides on top of the high voltage on these timer bases. Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty.

(c) Some meters will pickup static/stray electricity up to 2 volts.

6. **1988 and newer models:** Check the power pack resistance given below:

WIRE	(CYL)	READ TO	RESISTANCE
Orange/Blue	(#1)	Blue	110 (a)
Orange/Green	(#2)	Green	110 (a)
White		Black (Engine Ground)	Shorted
Brown & Brown/Yellow		Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires. You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

7. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the readings are low, disconnect the Orange wires from the ignition coils and reconnect them to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack.
8. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
9. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK ON ONE CYLINDER:

1. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
2. Swap the timer base wires and see if the problem follows a timer base wire.
3. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more while connected. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is good, the ignition coil is likely bad. A continued low reading indicates a bad power pack.
4. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
5. Swap the ignition coil with one that is sparking correctly.
6. Rare causes include a weak trigger magnet. If possible, try another flywheel.



## POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

## ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

## WILL NOT ACCELERATE BEYOND 3000 RPM (Runs smooth below that RPM):

1. Disconnect the Yellow wires from the rectifier and retest. If the engine has good spark, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more, increasing with engine RPM until it reaches 300-400 volts. A sharp drop in voltage right before the miss becomes apparent will normally be caused by a bad stator. A drop on only one Orange wire will normally be the power pack.
3. Check the stator resistance. If it reads approximately 900 ohms, replace it with the 500 ohm design.

## MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

### Models with S.L.O.W.

## ENGINE WILL NOT ACCELERATE BEYOND 2500 RPM:

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the Tan temperature wire from the pack and retest. If the engine now performs properly, check the temperature switch, harness and vacuum sensor.
3. Make sure the Tan temperature switch wire is not located next to a spark plug wire (RF interference can activate the SLOW function).
4. Check the stator resistance. If it reads approximately 900 ohms, replace it with the 500 ohm design.

## Three Cylinder Engines (Without Quick-Start)

### 1979-2001 60-75 HP Models

**Service Note:** Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".

## NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wire AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the ignition now has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550	150-400 V	150-400 V (*)
Orange	Orange/Black	450-550 (CDI 45-55)	11-22 V	45-120 V (*)
White	Purple	38-42	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)
White	Blue	38-42	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)
White	Green	38-42	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.



- (a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.
- 6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
- 7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

**NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:**

- 1. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
- 2. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a pack load resistor and retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack if the timer base checks good.
- 3. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
- 4. Swap the ignition coil with one that is sparking correctly.
- 5. Rare causes include a weak trigger magnet. If possible, try another flywheel.
- 6. **1988 and newer models:** Check the power pack resistance given below:

WIRE	(CYL)	READ TO	Resistance
Orange/Blue	(#1)	Blue	110 (a) (1988 & newer only)
Orange	(#2)	Green	110 (a) (1988 & newer only)
Orange/Green	(#3)	Purple	110 (a) (1988 & newer only)
White		Black (Engine Ground)	Shorted
Brown & Brown/Yellow		Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires. You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

**POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:**

- 1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
- 2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
- 3. Replace the ignition coil on the cylinder dropping spark.

**ENGINE WILL NOT SHUT OFF:**

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

**MISS AT ANY RPM:**

- 1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
- 2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
- 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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
- 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.
- 5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
- 6. Rotate the stator one bolt hole in either direction and retest.

**Models with S.L.O.W.**

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

- 1. Clean all engine and power pack ground connections.
- 2. Use a temperature probe and verify that the engine is not overheating.
- 3. Disconnect the Tan temperature wire from the pack and retest. If the engine now performs properly, the temperature switch is likely bad. Reconnect the Tan wire to the pack if it goes into the harness and disconnect the Tan wire from the temperature switch in the cylinder head. If the engine now performs normally, the temperature switch is defective. If it does not perform correctly, there is likely a problem in the engine harness, VRO (if equipped) or the boat harness.
- 4. Make sure the Tan temperature switch wire is not located next to a spark plug wire (RF interference can activate the SLOW function).

**Three Cylinder Engines  
(1993-2001 40-70 HP Quick-Start Models)**

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

**NO SPARK ON ANY CYLINDER:**

- 1. Disconnect the Black/Yellow stop wire AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.



2. Disconnect the Yellow wires from the rectifier and retest. If the ignition now has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550	150-400 V	150-400 V (*)
Orange	Orange/Black	450-550 (CDI 45-55)	11-22 V	45-120 V (*)
White	Purple	(c)	100-400 V (a)	0.6 V + (#)
White	Blue	(c)	100-400 V (a)	0.6 V + (#)
White	Green	(c)	100-400 V (a)	0.6 V + (#)
White	Black/White	400-500	6-12 V (b)	6-12 V (from pack)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) DVA will drop below 1 V when the engine drops out of Quick-Start (engine is over 104 Degrees or 1200 RPM).

(c) This reading will vary according to the meter used. Do a comparison reading and if there is a difference of over 10%, replace the timer base. Typically, use the Red meter lead to the White wire and the Black meter lead to the other wires. The Fluke series meters will typically read 1 MΩ to 2.4 MΩ while the CDI 511-60 meter will read about 5 MΩ.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Check the stator and timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
2. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack if the timer base checks good.
3. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
4. Swap the ignition coil with one that is sparking correctly.
5. Rare causes include a weak trigger magnet. If possible, try another flywheel.
6. Check the power pack resistance given below:

WIRE	(CYL)	READ TO	Resistance
Orange/Blue	(#1)	Blue	110 (a)
Orange	(#2)	Purple	110 (a)
Orange/Green	(#3)	Green	110 (a)
White		Black (Engine Ground)	Shorted
Brown & Brown/Yellow		Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires.

You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).



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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

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

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, the temperature switch is likely bad. Reconnect the Tan wire to the pack if it goes into the harness and disconnect the Tan wire from the temperature switch in the cylinder head. If the engine now performs normally, the temperature switch is defective. If it does not perform correctly, there is likely a problem in the engine harness, VRO (if equipped) or the boat harness.
3. Make sure the Tan temperature switch wire is not located next to a spark plug wire (RF interference can activate the SLOW function).

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

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.

### ENGINE STAYS IN QUICK-START:

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage over 2 volts on this wire while the engine is running, the Quick-Start will not disengage. A voltage of 5 to 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
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 WILL NOT ENGAGE QUICK-START:

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.
3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

### ENGINE TIMING TOO HIGH:

1. Check the flywheel center hub magnet to make sure it's tight. Look for signs of cracks and bulges in the Brown ferret magnet material.
2. Short the White/Black temp wire to engine ground and see if the timing drops back to normal.
3. Check the DC voltage on the Black/White wire going to the timer base. With the White/Black temp wire disconnected, the voltage should be 6 to 10 volts. When the White/Black temp wire is shorted to engine ground, the voltage should drop out. If the voltage on the Black/White wire stays in the 6-10 volt range, disconnect the Yellow/Red wire from the power pack. The voltage should drop out on the Black/White wire. If it does, the harness or starter solenoid is likely defective. If the voltage on the Black/White wire stays in the 6-10 volt range with the Yellow/Red wire disconnected and the White/Black wire shorted to engine ground, the power pack is defective.

## Four Cylinder Engines (Without Quick-Start) 1978-1987 85-140 HP Dual Power Pack Engines

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

### NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wire(s) AT THE POWER PACK(S) and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the engine has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550	150-400 V	150-400 V (*)
White	Blue	11-45	0.6 V +	0.6 V + (#)
White	Green	11-45	0.6 V +	0.6 V + (#)
White/Black	Blue/White	11-45	0.6 V +	0.6 V + (#)
White/Black	Green/White	11-45	0.6 V +	0.6 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.



(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE CYLINDER OR ONE BANK:

1. Disconnect the stop wires from both power packs and retest. If spark returns, swap the power packs and reconnect the stop circuit. If the no spark problem remains on the same bank, the stop circuit has a fault. If the problem moves, replace the power pack that was firing correctly due to a bad blocking diode in the pack.
2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
3. Check the stator and timer base resistance and DVA output on BOTH banks (see NO SPARK ON ANY CYLINDER above).
4. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack.
5. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
6. Swap the ignition coil with one that is sparking correctly.
7. Rare causes include a weak trigger magnet. If possible, try another flywheel.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

### ENGINE MISSES OR HAS ERRATIC TIMING:

1. Disconnect the Black/Yellow stop wire(s) AT THE POWER PACK(S) and retest. If the engine runs normally, the stop circuit could have a fault. Check the key switch, harness and shift switch. If all check good, replace the power pack. (For engines with dual power packs, replace BOTH power packs at the same time).
2. Check the stator and timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).

## Four Cylinder Engines (Without Quick-Start)

### 1985-1998 65-140 HP Single Power Pack Engines

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

### NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wire(s) AT THE POWER PACK(S) and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the engine has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.



5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550	150-400 V	150-400 V (*)
White	Purple	11-45	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)
White	Blue	11-45	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)
White	Green	11-45	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)
White	Pink	11-45	0.6 V + {1988 & newer 100-400 V (a)}	0.6 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE CYLINDER OR ONE BANK:

1. Swap the stator's Brown for Brown/Yellow and see if the problem moves. If it does, the stator is bad.
2. Check the stator and timer base resistance and DVA output on BOTH banks (see NO SPARK ON ANY CYLINDER above).
3. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack.
4. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
5. Swap the ignition coil with one that is sparking correctly.
6. Rare causes include a weak trigger magnet. If possible, try another flywheel.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack.

### MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

### ENGINE MISSES OR HAS ERRATIC TIMING:

1. Disconnect the Black/Yellow stop wire(s) AT THE POWER PACK(S) and retest. If the engine runs normally, the stop circuit could have a fault. Check the key switch, harness and shift switch. If all check good, replace the power pack. (For engines with dual power packs, replace BOTH power packs at the same time).
2. Check the stator and timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).

## Four Cylinder Engines (1988-2001 120-140 HP Quick-Start Models)

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

### NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wire AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.



2. Disconnect the Yellow wires from the rectifier and retest. If the engine has spark, replace the rectifier.
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. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550 (9 Amp)	150-400 V	150-400 V (*)
Brown	Brown/Yellow	950-1100 (35 Amp)	150-400 V	150-400 V (*)
Orange	Orange/Black	93-100 (CDI 45-55)	11-22 V	45-120 V (*)
White	Purple	35-55	0.6 V +	0.6 V + (#)
White	Blue	35-55	0.6 V +	0.6 V + (#)
White	Green	35-55	0.6 V +	0.6 V + (#)
White	Pink	35-55	0.6 V +	0.6 V + (#)
White	Purple/White	120-130	1.5 V +	1.5 V + (#)
White	Blue/White	120-130	1.5 V +	1.5 V + (#)
White	Green/White	120-130	1.5 V +	1.5 V + (#)
White	Pink/White	120-130	1.5 V +	1.5 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Disconnect the stop wire and retest (remember you will have to choke the engine to stop it). If the engine runs normally, the stop circuit has a fault.
2. Disconnect the White/Black temperature switch sensor and retest. If all cylinders now have spark, replace the timer base.
3. Check the stator and timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
4. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack.
5. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
6. Swap the ignition coil with one that is sparking correctly.
7. Rare causes include a weak trigger magnet. If possible, try another flywheel.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.



## ENGINE WILL NOT ACCELERATE BEYOND 2500 RPM:

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, the temperature switch is likely bad. Reconnect the Tan wire to the pack if it goes into the harness and disconnect the Tan wire from the temperature switch in the cylinder head. If the engine now performs normally, the temperature switch is defective. If it does not perform correctly, there is likely a problem in the engine harness, VRO (if equipped) or the boat harness.
3. Make sure the tan temperature switch wire is not located next to a spark plug wire.

## ENGINE DIES WHEN QUICK-START DROPS OUT:

Check ignition timing at idle with the White/Black temperature wire disconnected. Remember to allow for the drop in ignition timing (approximately 10-15 degrees) when Quick-Start disengages. Verify ignition timing after engine has warmed up, according to the service manual.

## ENGINE STAYS IN QUICK-START:

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage over 2 volts on this wire while the engine is running, the Quick-Start will not disengage. A voltage of 5 to 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
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 WILL NOT ENGAGE QUICK-START:

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.
3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

## Six Cylinder Engines (Without Quick-Start)

### 1979-1988 150-235 HP Dual Power Pack Engines

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

## NO SPARK ON ANY CYLINDER:

1. Disconnect the Black/Yellow stop wires AT THE POWER PACKS and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the engine now has spark, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	450-550 (9 Amp)	150-400 V	150-400 V (*)
Brown	Brown/Yellow	950-1100 (35 Amp)	150-400 V	150-400 V (*)
White	Purple	15-50 (a)	0.6 V +	0.6 V + (#)
White	Blue	15-50 (a)	0.6 V +	0.6 V + (#)
White	Green	15-50 (a)	0.6 V +	0.6 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Use a comparison reading as the values for different years used different coils in the timer base. As long as you have approximately the same ohm reading on all three tests and the correct output with the DVA meter for both sides, the timer base should be good. The exception would be if the insulation is breaking down while the engine is running.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

## NO SPARK OR INTERMITTENT SPARK ON ONE BANK:

1. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
2. Disconnect the stop wires from both power packs and retest. If the spark returns, swap the power packs and reconnect the stop circuit. If the no spark problem remains on the same bank, the stop circuit has a fault. If the problem moves, replace the power



pack that was firing correctly due to a bad blocking diode in the pack.

3. Check the stator and timer base resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
4. Check the DVA voltage to engine ground on the White timer base wire while connected to the pack. You should see approximately the same reading as you do between the Brown & Brown/Yellow wires for that bank. A low reading usually indicates a bad timer base.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
2. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack or timer base.
3. Check the timer base resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
4. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
5. Swap the ignition coil with one that is sparking correctly.
6. Rare causes include a weak trigger magnet. If possible, try another flywheel.
7. Swap banks with the power packs and see if the problem moves. If it does, replace the power pack. If not, replace the timer base.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wire at the power pack. Connect a jumper wire to the stop wire from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

### ENGINE MISSES OR HAS ERRATIC TIMING:

1. Disconnect the Black/Yellow stop wires AT THE POWER PACKS and retest. If the engine runs normally, the stop circuit could have a fault. Check the key switch, harness and shift switch. If all check good, replace BOTH power packs at the same time.
2. Check the stator and timer base resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).

## Six Cylinder Engines (Without Quick-Start)

### 1989-1991 150 HP Single Power Pack Engines (With 583816/584044 Power Pack)

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

### NO SPARK ON ANY CYLINDER:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the rectifier and retest. If the engine now has spark, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.



5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow (1st Pair) (c)	450-550 (9 Amp)	150-400 V	150-400 V (*)
Brown/White	Brown/Black (2nd Pair) (c)	450-550 (9 Amp)	150-400 V	150-400 V (*)
Black	Purple	15-50 (b)	100-400 V (a)	0.6 V + (#)
Black	Blue	15-50 (b)	100-400 V (a)	0.6 V + (#)
Black	Green	15-50 (b)	100-400 V (a)	0.6 V + (#)
Black	Purple/White	15-50 (b)	100-400 V (a)	0.6 V + (#)
Black	Blue/White	15-50 (b)	100-400 V (a)	0.6 V + (#)
Black	Green/White	15-50 (b)	100-400 V (a)	0.6 V + (#)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) Use a comparison reading as the values for different years used different coils in the timer base. As long as you have approximately the same ohm reading on all three tests and the correct output with the DVA meter for both sides, the timer base should be good. The exception would be if the insulation is breaking down while the engine is running.

(c) Wires must be paired correctly. If the wires are crossed between pairs, the resulting feedback will destroy the power pack.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.  
 7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE BANK:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition now has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
3. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Check the stator resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
5. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one bank, disconnect the Orange wires from the ignition coil for that bank and reconnect them to a load resistor. Retest. If the reading is now good, one or all of the ignition coils are likely bad. A continued low reading indicates a bad power pack.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
2. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack or timer base.
3. Check the stator and timer base resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
4. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
5. Swap the ignition coil with one that is sparking correctly.
6. Rare causes include a weak trigger magnet. If possible, try another flywheel.
7. Identify the timer base wire responsible for the problem cylinder {remember that the color codes are Blue (sky) is up and Green (grass) is down} and swap it with one that is operating correctly. In order to run the engine, you will have to also swap the corresponding spark plug wire.

### POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### ENGINE WILL NOT SHUT OFF:

Disconnect the stop wires at the power pack. Connect a jumper wire to the stop wires from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.



## MISS AT ANY RPM:

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

## Six Cylinder Engines

(1989-1992 150-175 HP GT Cross-Flow Quick-Start Models)

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

(Note) These engines usually have a 35 Amp battery charging capacity. Due to the size and weight of the flywheel magnets, it is highly recommended that you check to make sure both the triggering and charge magnets are still secure in the flywheel before you service the engine. A loose or broken magnet can be deadly to you or your pocketbook. It is a recommended you index the flywheel and check the timing on all cylinders when servicing these engines. Also check for static firing and intermittent spark.

## NO SPARK ON ANY CYLINDER:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow (1st Pair) (d)	900-1100 (35 amp)	150-400 V	150-400 V (*)
Brown/White	Brown/Black (2nd Pair) (d)	900-1100 (35 amp)	150-400 V	150-400 V (*)
Orange	Orange/Black	93-103	11-22 V	45-120 V (*)
White	Purple	(c)	100-400 V (a)	0.6 V + (#)
White	Blue	(c)	100-400 V (a)	0.6 V + (#)
White	Green	(c)	100-400 V (a)	0.6 V + (#)
White	Purple (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Blue (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Green (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Black/White (2nd connector)	215-225	6-12 V (b)	6-12 V (from pack)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) DVA will drop below 1 V when the engine drops out of Quick-Start (engine is over 104 Degrees or 1200 RPM).

(c) Use a comparison reading as different brands of meters will give different readings. The typical range is 1M to 5M ohms. As long as you have approximately the same ohm reading on all six tests and the correct output with the DVA meter, the timer base should be good. Remember that temperature will affect the readings. The exception would be if one of the SCR's inside the timer base is breaking down while the engine is running. This can be found indexing the flywheel and checking the timing on all cylinders. If the readings are off, reverse the meter leads and retest to see if the readings are corrected.

(d) Wires must be paired correctly. If the wires are crossed between pairs, the resulting feedback will destroy the power pack.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

## NO SPARK OR INTERMITTENT SPARK ON ONE BANK:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition now has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
3. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
4. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually



caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.

5. Check the stator resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
6. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one bank, disconnect the Orange wires from the ignition coil for that bank and reconnect them to a load resistor. Retest. If the reading is now good, one or all of the ignition coils are likely bad. A continued low reading indicates a bad power pack.

**NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:**

1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
2. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad.
3. Check the timer base resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
4. Check the power pack resistance given below:

Wire Color	(CYL)	Check to Wire Color	Resistance
Orange/Blue	(#1)	Blue (in male 4 pin connector with White wire)	110 (a)
Orange	(#3)	Purple (in male 4 pin connector with White wire)	110 (a)
Orange/Green	(#5)	Green (in male 4 pin connector with White wire)	110 (a)
Orange/Blue	(#2)	Blue (in female 4 pin connector with Black/White wire)	110 (a)
Orange	(#4)	Purple (in female 4 pin connector with Black/White wire)	110 (a)
Orange/Green	(#6)	Green (in female 4 pin connector with Black/White wire)	110 (a)
White		Black (Engine Ground)	Shorted
Brown, Brown/Yellow		Black (Engine Ground)	Open or M range
Brown/White, Brown/Black		Black (Engine Ground)	Open or M range
Orange, Orange/Black		Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms. You should have approximately the same ohm reading on all six tests. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

5. Check the spark plug wires for breaks and abrasions.
6. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
7. Swap the ignition coil with one that is sparking correctly.
8. Rare causes include a weak trigger magnet. If possible, try another flywheel.

**POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:**

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

**ENGINE WILL NOT SHUT OFF:**

Disconnect the stop wires at the power pack. Connect a jumper wire to the stop wires from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

**MISS AT ANY RPM:**

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

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

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, the temperature switch is likely bad. Reconnect the Tan wire to the pack if it goes into the harness and disconnect the Tan wire from the temperature switch in the cylinder head. If the engine now performs normally, the temperature switch is defective. If it does not perform correctly, there is likely a problem in the engine harness, VRO (if equipped) or the boat harness.



3. Make sure the tan temperature switch wire is not located next to a spark plug wire.
4. Disconnect the VRO sensor from the engine harness and retest. If the engine performs correctly, replace the VRO or sensor.

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

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.

### ENGINE STAYS IN QUICK-START:

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage over 2 volts on this wire while the engine is running, the Quick-Start will not disengage. A voltage of 5 to 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
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 WILL NOT ENGAGE QUICK-START:

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.
3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

### ENGINE TIMING TOO HIGH:

1. Check the flywheel center hub magnet to make sure it's tight. Look for signs of cracks and bulges in the Brown ferret magnet material.
2. Short the White/Black temp wire to engine ground and see if the timing drops back to normal.
3. Check the DC voltage on the Black/White wire going to the timer base. With the White/Black temp wire disconnected, the voltage should be 6 to 10 volts. When the White/Black temp wire is shorted to engine ground, the voltage should drop out. If the voltage on the Black/White wire stays in the 6-10 volt range, disconnect the Yellow/Red wire from the power pack. The voltage should drop out on the Black/White wire. If it does, the harness or starter solenoid is likely defective. If the voltage on the Black/White wire stays in the 6-10 volt range with the Yellow/Red wire disconnected and the White/Black wire shorted to engine ground, the power pack is defective.

## Six Cylinder Engines (1988-2001 185-250 HP Quick-Start Models)

**Service Note: Please use the Factory recommended spark plug (currently Champion QL77JC4) gapped at 0.030".**

(Note) These engines usually have a 35 Amp battery charging capacity. Due to the size and weight of the flywheel magnets, it is highly recommended that you check to make sure both the triggering and charge magnets are still secure in the flywheel before you service the engine. A loose or broken magnet can be deadly to you or your pocketbook. It is a recommended you index the flywheel and check the timing on all cylinders when servicing these engines. Also check for static firing and intermittent spark.

### NO SPARK ON ANY CYLINDER:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.
5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	900-1100 (35 amp)	150-400 V	150-400 V (*)
Orange	Orange/Black	93-103	11-22 V	45-120 V (*)
White	Purple	(c)	100-400 V (a)	0.6 V + (#)
White	Blue	(c)	100-400 V (a)	0.6 V + (#)
White	Green	(c)	100-400 V (a)	0.6 V + (#)
White	Purple (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Blue (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Green (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Black/White (2nd connector)	215-225	6-12 V (b)	6-12 V (from pack)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.



- (a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.
- (b) DVA will drop below 1 V when the engine drops out of Quick-Start (engine is over 104 Degrees or 1200 RPM).
- (c) Use a comparison reading as different brands of meters will give different readings. The typical range is 1M to 5M ohms. As long as you have approximately the same ohm reading on all six tests and the correct output with the DVA meter, the timer base should be good. Remember that temperature will affect the readings. The exception would be if one of the SCR's inside the timer base is breaking down while the engine is running. This can be found indexing the flywheel and checking the timing on all cylinders. If the readings are off, reverse the meter leads and retest to see if the readings are corrected.

- 6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.
- 7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

**NO SPARK OR INTERMITTENT SPARK ON ONE BANK:**

- 1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK and retest. If the engine's ignition now has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
- 2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
- 3. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
- 4. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
- 5. Check the stator resistance and DVA output for BOTH banks (see NO SPARK ON ANY CYLINDER above).
- 6. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one bank, disconnect the Orange wires from the ignition coil for that bank and reconnect them to a load resistor. Retest. If the reading is now good, one or all of the ignition coils are likely bad. A continued low reading indicates a bad power pack.

**NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:**

- 1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
- 2. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
- 3. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack or timer base.

- 4. Check the power pack resistance given below:

Wire Color	(CYL)	Check to Wire Color	Resistance
Orange/Blue	(#1)	Blue (in 4 pin connector with Black/White wire)	110 (a)
Orange	(#3)	Purple (in 4 pin connector with Black/White wire)	110 (a)
Orange/Green	(#5)	Green (in 4 pin connector with Black/White wire)	110 (a)
Orange/Blue	(#2)	Blue (in 4 pin connector with White wire)	110 (a)
Orange	(#4)	Purple (in 4 pin connector with White wire)	110 (a)
Orange/Green	(#6)	Green (in 4 pin connector with White wire)	110 (a)
White		Black (Engine Ground)	Shorted
Brown		Black (Engine Ground)	Open or M range
Brown/Yellow		Black (Engine Ground)	Open or M range
Brown/White		Black (Engine Ground)	Open or M range
Brown/Black		Black (Engine Ground)	Open or M range

(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires. You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

- 5. Check the spark plug wires for breaks and abrasions.
- 6. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
- 7. Swap the ignition coil with one that is sparking correctly.
- 8. Rare causes include a weak trigger magnet. If possible, try another flywheel.

**POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:**

- 1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
- 2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
- 3. Replace the ignition coil on the cylinder dropping spark.

**ENGINE WILL NOT SHUT OFF:**

Disconnect the stop wires at the power pack. Connect a jumper wire to the stop wires from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

**MISS AT ANY RPM:**

- 1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.



2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

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

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, test and replace the defective temperature switch.
3. Make sure the tan temperature switch wire is not located next to a spark plug wire.
4. Disconnect the VRO sensor from the engine harness and retest. If the engine performs correctly, replace the VRO or sensor.

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

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.

### ENGINE STAYS IN QUICK-START:

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage over 2 volts on this wire while the engine is running, the Quick-Start will not disengage. A voltage of 5 to 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
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 WILL NOT ENGAGE QUICK-START:

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.
3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

### ENGINE TIMING TOO HIGH:

1. Check the flywheel center hub magnet to make sure it's tight. Look for signs of cracks and bulges in the Brown ferret magnet material.
2. Short the White/Black temp wire to engine ground and see if the timing drops back to normal.
3. Check the DC voltage on the Black/White wire going to the timer base. With the White/Black temp wire disconnected, the voltage should be 6 to 10 volts. When the White/Black temp wire is shorted to engine ground, the voltage should drop out. If the voltage on the Black/White wire stays in the 6-10 volt range, disconnect the Yellow/Red wire from the power pack. The voltage should drop out on the Black/White wire. If it does, the harness or starter solenoid is likely defective. If the voltage on the Black/White wire stays in the 6-10 volt range with the Yellow/Red wire disconnected and the White/Black wire shorted to engine ground, the power pack is defective.

## Eight Cylinder Engines (1988-1998 250-300 HP Quick-Start Models)

(Note) These engines usually have a 35 Amp battery charging capacity. Due to the size and weight of the flywheel magnets, it is highly recommended that you check to make sure both the triggering and charge magnets are still secure in the flywheel before you service the engine. A loose or broken magnet can be deadly to you or your pocketbook. It is a recommended you index the flywheel and check the timing on all cylinders when servicing these engines. Also check for static firing and intermittent spark.

### NO SPARK ON ANY CYLINDER:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK(S) and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
3. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
4. Inspect and clean all engine and ignition ground connections.



5. Check the stator and timer base resistance and DVA output as given below for BOTH banks:

WIRE	READ TO	RESISTANCE	DVA (Connected)	DVA (Disconnected)
Brown	Brown/Yellow	900-1100 (35 amp)	150-400 V	150-400 V (*)
Orange	Orange/Black	93-103	11-22 V	45-120 V (*)
White	Purple	(c)	100-400 V (a)	0.6 V + (#)
White	Blue	(c)	100-400 V (a)	0.6 V + (#)
White	Green	(c)	100-400 V (a)	0.6 V + (#)
White	Pink	(c)	100-400 V (a)	0.6 V + (#)
White	Purple (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Blue (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Green (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Pink (2nd connector)	(c)	100-400 V (a)	0.6 V + (#)
White	Black/White (2nd connector)	215-225	6-12 V (b)	6-12 V (from pack)

(\*) This reading can be used to determine if a stator or pack has a problem. For instance, if you have no spark on any cylinder and the stator's DVA reading is out of spec – disconnect the stator wires and recheck the DVA output. If the reading is still out of spec – the stator is bad. If the reading is now within spec – the pack is bad.

(#) This reading can be used to determine if a pack has a problem in the triggering circuit. For instance, if you have no spark on one cylinder and the timer base's DVA reading for that cylinder is low – disconnect the timer base wires and recheck the DVA output. If the reading stays low – the timer base is bad. If the reading is now within spec – the pack is bad.

(a) Check stator DVA first. Then if timer base DVA is 0.6 - 2.5 V, the pack is faulty. If below 0.6 V or 2.6 - 99 V, the timer base is faulty.

(b) DVA will drop below 1 V when the engine drops out of Quick-Start (engine is over 104 Degrees or 1200 RPM).

(c) Use a comparison reading as different brands of meters will give different readings. The typical range is 1M to 5M ohms. As long as you have approximately the same ohm reading on all six tests and the correct output with the DVA meter, the timer base should be good. Remember that temperature will affect the readings. The exception would be if one of the SCR's inside the timer base is breaking down while the engine is running. This can be found indexing the flywheel and checking the timing on all cylinders. If the readings are off, reverse the meter leads and retest to see if the readings are corrected.

6. Check the center hub triggering magnet in the flywheel. A loose magnet can cause this problem.

7. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.

### NO SPARK OR INTERMITTENT SPARK ON ONE BANK or CYLINDERS 1-4 or 5-8:

1. Disconnect BOTH of the Black/Yellow stop wires AT THE POWER PACK(S) and retest. If the engine's ignition has spark, the stop circuit has a fault. Check the key switch, harness and shift switch.
2. Swap the stator wire pairs from one side of the engine to the other side and see if the problem moves. If it does, the stator is bad.
3. Disconnect the Yellow wires from the stator to the rectifier and retest. If the engine sparks, replace the rectifier.
4. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
5. Check the stator and timer base resistance and DVA output on BOTH banks (see NO SPARK ON ANY CYLINDER above).
6. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one bank, disconnect the Orange wires from the ignition coil for that bank and reconnect them to a load resistor. Retest. If the reading is now good, one or all of the ignition coils are likely bad. A continued low reading indicates a bad power pack.

### NO SPARK OR INTERMITTENT SPARK ON ONE OR MORE CYLINDERS:

1. Check the cranking RPM. A cranking speed of less than 250-RPM will not allow the system to spark properly. This is usually caused by a weak battery or dragging starter. Connect a battery charger on its highest setting to the battery and retest. If good spark, replace the starter and/or battery with an 850+ CCA cranking/dual purpose non-maintenance-free type.
2. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V or more. If the reading is low on one cylinder, disconnect the Orange wire from the ignition coil for that cylinder and reconnect it to a load resistor. Retest. If the reading is now good, the ignition coil is likely bad. A continued low reading indicates a bad power pack or timer base.
4. Check the power pack resistance given below:

Wire Color	(CYL)	Check to Wire Color	Resistance
Orange/Blue	(#1)	Blue (in 5 pin connector with White wire)	110 (a)
Orange/Green	(#3)	Green (in 5 pin connector with White wire)	110 (a)
Orange/Blue/White	(#5)	Blue (in 5 pin connector with Black/White wire)	110 (a)
Orange/Green/White	(#7)	Green (in 5 pin connector with Black/White wire)	110 (a)
Orange/Purple	(#2)	Purple (in 5 pin connector with White wire)	110 (a)
Orange/Pink (or Red)	(#4)	Pink (in 5 pin connector with White wire)	110 (a)
Orange/Purple/White	(#6)	Purple (in 5 pin connector with Black/White wire)	110 (a)
Orange/Pink/White	(#8)	Pink (in 5 pin connector with Black/White wire)	110 (a)
White		Black (Engine Ground)	Shorted
Brown		Black (Engine Ground)	Open or M range
Brown/Yellow		Black (Engine Ground)	Open or M range
Brown/White		Black (Engine Ground)	Open or M range
Brown/Black		Black (Engine Ground)	Open or M range



(a) Use a comparison reading as different brands of meters will give different readings. The typical range is 90 to 150 ohms for the Orange wires. You should have approximately the same ohm reading on all six tests with the Orange wires. If one of the SCR's inside the power pack is shorted or open, the readings will be quite a bit different.

5. Check the spark plug wires for breaks and abrasions.
6. Visually inspect the ignition coils for burned or discolored areas and cracks in the casing (indicating arcing inside the coil).
7. Swap the ignition coil with one that is sparking correctly.
8. Rare causes include a weak trigger magnet. If possible, try another flywheel.

### **POWER PACK OR TIMER BASE REPEATEDLY BLOWS ON SAME CYLINDER:**

1. Check the timer base wires for shorts to engine ground as a shorted timer base wire can destroy a SCR inside the power pack.
2. In contrast, a shorted SCR inside the power pack can destroy a timer base coil. Check the timer base resistance and DVA output (see NO SPARK ON ANY CYLINDER above).
3. Replace the ignition coil on the cylinder dropping spark.

### **ENGINE WILL NOT SHUT OFF:**

Disconnect the stop wires at the power pack. Connect a jumper wire to the stop wires from the pack and short it to engine ground. If this stops the pack from sparking, the stop circuit has a fault. Check the key switch, harness and shift switch. If this does not stop the pack from sparking, replace the power pack. Repeat test as necessary for additional packs.

### **MISS AT ANY RPM:**

1. Disconnect the Yellow wires from the stator to the rectifier and retest. If the miss clears, replace the rectifier.
2. In the water or on a Dynameters, check the DVA output on the Orange wires from the power pack while connected to the ignition coils. You should have a reading of at least 150V DVA or more, increasing with engine RPM until it reaches 300-400V 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 or timer base.
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 power pack or ignition coil. Occasionally a timer base will cause this same problem. Check the timer base DVA voltage (see NO SPARK ON ANY CYLINDER above).
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.
5. Check the triggering and charge coil flywheel magnets for cracked, broken and loose magnets.
6. Rotate the stator one bolt hole in either direction and retest.

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

1. Use a temperature probe and verify that the engine is not overheating.
2. Disconnect the tan temperature wire from the pack and retest. If the engine now performs properly, test and replace the defective temperature switch, VRO, engine harness or boat harness.
3. Make sure the tan temperature switch wire is not located next to a spark plug wire.
4. Disconnect the VRO sensor from the engine harness and retest. If the engine performs correctly, replace the VRO or sensor.

### **ENGINE STAYS IN QUICK-START:**

1. With the engine idling, check the Yellow/Red wire for DC voltage. If there is DC voltage on this wire while the engine is running, the Quick-Start will not disengage. A voltage of less than 7 volts will not engage the starter solenoid, yet will engage Quick-Start.
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:**

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.

### **ENGINE WILL NOT ENGAGE QUICK-START:**

1. Disconnect the White/Black wire from the temperature sensor.
2. With the engine idling, check the Black/White timer base wire for DC voltage. There should be about 6 to 10 volts DC voltage on this wire while the engine is running for the Quick-Start to engage.
3. Short the White/Black temperature switch wire FROM the power pack to engine ground. If the voltage on the Black/White wire drops out after approximately 5 seconds but the engine timing does not change, replace the timer base. If the voltage remains present, disconnect the Yellow/Red wire to the pack and repeat the test. If the voltage still remains, replace the pack.

### **ENGINE TIMING TOO HIGH:**

1. Check the flywheel center hub magnet to make sure it's tight. Look for signs of cracks and bulges in the Brown ferret magnet material.
2. Short the White/Black temp wire to engine ground and see if the timing drops back to normal.
3. Check the DC voltage on the Black/White wire going to the timer base. With the White/Black temp wire disconnected, the voltage should be 6 to 10 volts. When the White/Black temp wire is shorted to engine ground, the voltage should drop out. If the voltage on the Black/White wire stays in the 6-10 volt range, disconnect the Yellow/Red wire from the power pack. The voltage should drop out on the Black/White wire. If it does, the harness or starter solenoid is likely defective. If the voltage on the Black/White wire stays in the 6-10 volt range with the Yellow/Red wire disconnected and the White/Black wire shorted to engine ground, the power pack is defective.