



# Instructions Model CD-77 Peak Reading Voltmeter

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## GENERAL INFORMATION

The CD-77 is a peak reading voltmeter (often referred to as DVA) designed specifically for testing CD ignition systems. The meter has three scales: 0-5, 0-50 and 0-500, corresponding to the settings of the right hand range selector switch. The left hand switch selects sensor position for measuring trigger voltages and the other two positions select polarity of the voltage to be measured, either positive or negative.

The test leads have pin type terminations which can be plugged directly into the connectors used with the OMC connector type systems. A plug-in clip is also furnished with the black test lead for use when it is necessary to clip to a ground.

Overload protection is provided by an internal protection circuit; however, if the needle swings hard against the right end of the scale or vibrates against the left end of the scale, disconnect or stop cranking as quickly as possible and recheck switch settings

and connections.

Jumper wires are furnished for tests on the connector type systems. Three of the jumpers have single terminals for straight through connections between plugs. The other two jumpers are "piggy-back" types with an extra terminal so that the meter can be plugged in for readings with the system in operation.

Using one of the Stevens adaptors precludes the need for jumpers on most engines. Remember that switch positions on SA-77, SA-5 and SA-6 adaptors ON or OFF, are critical to obtaining proper test results.

The CD-77 may be used to read peak voltage on any engine for which peak voltage (or DVA) specifications are available. In addition, the following instructions cover all basic types of OMC CD systems, from early battery CD to early 90's.

**SENSOR NOTE:** All original peak voltmeters were made with a Sensor position (SEN). This position is more sensitive on the CD-77 than on other brands, so you may expect unusually high readings on some engines. This is okay as long as readings meet the minimum spec. Some manuals call for testing sensors on the POS position. This is only to accommodate testers which lack a sensor position; continue to use the SEN position on the CD-77 for all sensor tests.

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**Heads Up:** When using a spark checker, be sure it is an *open gap* tester and not one which sparks across the surface of a board. Sparks burn a carbon path on boards, allowing a very weak spark to look good. Gap settings on such a spark checker are meaningless.

## BATTERY CD

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Following is a general test procedure for battery CD systems. Refer to manuals or diagrams for specific engines if additional information is required.

Note: Battery should be fully charged before proceeding with tests. The CD-77 is *not* a DC voltmeter and will read slightly lower than actual voltage. Take an initial reading directly across a fully charged battery to determine the exact CD-77 reading.

### **PACK INPUT TEST**                      **Set Meter:      POS – 50**

Connect black test lead to engine ground. Connect red test lead to pack input wire with pack connected. With ignition on, reading should be same as battery voltage (approximately 11 or more).

Crank engine. Reading should not drop more than 2 ½ volts.

If there is no voltage or low voltage at pack input, trace back point to point with red test lead through connectors, terminals, wires, ignition switch etc. (safety switch or voltage suppressor on some models) to locate point of failure.

### **PACK OUTPUT TEST**                      **Set Meter:      POS – 500**

Connect black test lead to engine ground. Connect red test lead to coil primary, leaving coil connected. *Coils should remain connected to avoid damage to packs.*

Crank engine. Reading should be 250 volts or higher. If no reading:

- |                         |  |
|-------------------------|--|
| Sensor equipped engines | Substitute a test sensor and activate. If reading is okay with test sensor, check engine sensor leads, gap, cracks on sensor face etc.<br>If no reading with test sensor, disconnect ignition coil and check with coil analyzer. If coil is okay, pack is bad.   |
| Breaker point engines   | Disconnect ignition coil and check on coil analyzer..If coil is okay, reconnect to pack. Reconnect red test lead to coil.<br>Disconnect wire between pack and points. With key switch on, touch amplifier connector to ground intermittently. No reading, pack is bad.<br>Reading okay, trouble is in breaker point circuit. |

## PACK TERMINAL SYSTEMS

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NOTE: V-6 engines are tested same as Power Pack III, one side at a time. When testing one side, remove key switch lead (black/yellow stripe) from pack on other side and insulate with tape. Battery must be fully charged before testing.

### **SPARK TEST**

Remove high tension spark plug leads from spark plugs and connect to spark checker. Set gap on spark checker according to service manual.

Crank engine. If spark jumps each gap alternately, ignition system is okay. Check spark plugs and other engine systems.

If weak, erratic or no spark from one coil, go to sensor test.

If weak or erratic spark from ALL coils go to charge coil test.

If no spark from all coils, go to key switch test.

### **KEY SWITCH TEST**

Remove black/yellow stripe lead from power pack terminal. Crank engine and observe spark.

Spark okay on all coils, trouble is in key switch or key switch lead.

No spark from any coil, leave key switch lead disconnected and go to Charge Coil Test.

Spark on only one ignition coil, one problem is in key switch or switch lead. Repair problem and go to Sensor Test.

**CHARGE COIL OUTPUT TEST****Set Meter      NEG – 500****POWER PACK II**

Remove brown lead from power pack terminal 1. Connect red probe to brown lead. Connect black probe to engine ground.

**POWER PACK III**

Remove brown lead and brown/orange stripe lead from terminals 4 & 5. Connect red probe to brown lead. Connect black probe to brown/orange.

**POWER PACK IV**

Remove brown lead and brown/yellow stripe lead from terminals 7 & 8. Connect red probe to brown lead. Connect black probe to brown/yellow.

Crank engine. Meter should read 230 or higher.

If reading okay, charge coils okay

If reading low, check resistance of charge coils.

If resistance out of spec, replace charge coils

If resistance okay, replace flywheel.

**POWER PACK II**

Reconnect brown lead to terminal 1 and go to Sensor Test.

**POWER PACKS III AND IV**

Continue with charge coil short to ground test.

**CHARGE COIL SHORT TO GROUND TEST****Set Meter:      NEG – 500**

Connect black meter lead to ground and leave red meter lead connected to brown wire. Crank engine. Move red meter lead to other charge coil lead (brown/orange or brown/yellow) and repeat.

If no meter reading on both checks, charge coils are okay. Go to Sensor Test.

If there is any meter reading above zero, charge coils are grounded.

Reconnect charge coil leads to power pack.

**SENSOR COIL OUTPUT TEST****Set Meter:      SEN – 5**

Note: If spark is present at spark checker during sensor tests, replace power pack.

**POWER PACK II**

Remove both sensor leads from terminals 6 & 7. Connect red probe to either lead and black probe to the other.

**POWER PACK III**

Remove sensor leads from terminals 8, 9, 10 and 11. Connect black probe to black/white stripe lead removed from terminal 11. Connect red probe to lead removed from terminal 8.

**POWER PACK IV**

Remove sensor leads from terminals 2, 4, 9 and 12. Connect red probe to lead removed from terminal 2. Connect black probe to lead removed from terminal 4.

Crank engine. Meter should read .3 or higher.

**POWER PACK II**

Reverse meter leads and repeat test

**POWER PACK III**

Move red probe to sensor lead from 9 and repeat test, then to lead from 10 and repeat.

**POWER PACK IV**

Reverse probes and repeat test. Then change probes to leads from 9 and 12 and repeat above steps.

If reading okay, continue with Short to Ground Test.

If reading low, check sensor resistance.

If low resistance, replace sensor.

If resistance okay, problem can be too large sensor air gap, weak sensor magnets in flywheel or too low cranking speed.

**SENSOR SHORT TO GROUND TEST****Set Meter:      SEN – 5**

Connect black probe to ground. Connect red probe to each of the sensor leads one at a time and crank engine.

If no reading, continue with Power Pack Output Test.

If any reading above zero, sensors are grounded. Repair or replace.

Reconnect sensor leads to proper power pack terminals.

**POWER PACK OUTPUT TEST****Set Meter:      NEG – 500**

Connect black meter lead to engine ground.

**POWER PACK II**  
Connect red probe to power pack terminal 2 and crank engine. Meter should read 180 or more. Repeat with red probe at terminal 3.

**POWER PACK III**  
Connect red probe to power pack terminal 1 and crank engine. Meter should read 170 or more. Repeat with red probe at terminals 2 and 3.

**POWER PACK IV**  
Connect red probe to power pack terminal 3 and crank engine. Meter should read 170 or more. Repeat with red probe at terminals 5, 10 & 11.

Readings okay but still no spark, check ignition coil(s).

If pack readings low, disconnect coil primary from pack (one at a time) and connect red probe to terminal. Crank engine.

If reading low, pack is defective.

If reading okay, check ignition coil(s). If coil(s) okay, pack is defective.

### FINAL TEST

Make a final spark test of the entire ignition system with all leads connected to the power pack.

## CONNECTOR SYSTEMS

### 2 & 4 cylinder through 1988 except 1988 Loop V

The following is a systematic procedure for checking the CD II ignition system. Whenever possible, it is recommended that service manual procedures be followed. An additional test in the V-4 manuals covers "Rough Running Engines".

Readings used here are based on hand cranking through 1984 and on starter cranking thereafter.

### VISUAL INSPECTION

Check wiring for broken, pinched or loose leads, connector misalignment, etc.

### SPARK TEST

Remove high tension leads from spark plugs and connect to spark checker. Spark checker remains connected for all other tests. Set gap to ½ inch. Crank engine.

If spark jumps each gap alternately, ignition system is okay. Check spark plugs and other engine systems.

If no spark, go to key switch or stop button elimination test in service manual.

If spark at only one gap, go to resistance tests for charge coils and sensor coils in service manuals.

### CHARGE COIL OUTPUT TEST

**Set Meter: NEG – 500**

Disconnect connector between armature plate and pack.....

Insert probes in connector from armature plate.....

2 cylinder, pre-1985

4-wire

Red to A, Black to D

2 cylinder, 1985 and later

5-wire

Red to A, Black to D

V-4

2-wire

Red to A, Black to B

Crank engine. Meter should read minimum:	2 cylinder	230
	V-4 pre-1985	160
	V-4 1985 and later dual pack	150
	single pack	175
	Cross V 1988	150

If reading okay, check for short to ground.

If no reading, replace charge coil.

If low reading, check resistance of charge coil.

If resistance low, replace charge coil.

If resistance okay, replace flywheel

### CHARGE COIL SHORT TO GROUND TEST

**Set Meter: NEG – 500**

Use same connectors as for Output Tests above. Connect black probe to stator base.

Connect red probe to:

2 cylinder -

A then repeat to D

V-4 -

A then repeat to B



If spark jumps each gap alternately, ignition system is okay. Check spark plugs and other systems.  
 If no spark or poor spark, see key switch test in service manual.

Spark checker remains connected for all other tests. Prior to testing see Service Manual for Rough Running Engine test (V-6 only).

**CHARGE COIL OUTPUT TEST                      Set Meter:        NEG – 500**

Disconnect 2-wire connector (3-wire on 1985 and later 3 cylinders) between stator and pack. Insert meter red probe in cavity B and black probe in cavity A of connector from stator.

Crank engine. Meter should read:

3 cylinder pre-1985		220	If reading okay, check for short to ground. If no reading, replace charge coil. If low reading, check resistance of charge coil.  If resistance low, replace charge coil. If resistance okay replace flywheel.
3 cylinder 1985 and later		250	
6 cylinder pre-1985		160	
6 cylinder 1985 and later	150-175	200	
	200-225	130	

**CHARGE COIL SHORT TO GROUND TEST                      Set Meter:        NEG – 500**

Using same connectors as above, connect meter black probe to armature plate ground, red probe to connector terminal B. Crank engine. If there is any meter reading, charge coil is shorting to ground. Repeat with red probe to terminal A. Reconnect and proceed with Sensor Tests.

**SENSOR OUTPUT TEST                      Set Meter:        SEN – 5**

NOTE: Because of its sensitivity on Sensor setting the CD-77 will generally read considerably higher than the figures given in the service manuals, particularly on smaller engines where cranking speeds are higher.

Disconnect 4-wire connector from stator to pack. Connect red probe to terminal A of connector from stator. Connect black probe to D. Crank engine. Repeat with red probe to B and again to C.

Meter should read:	3 cylinder thru 1985	.4
	1986-1988	.3
	V-6 pre-1985	.25
	V-6 1985 & later, 150-175	.2
	200-225	.3

If reading okay, check for Short to Ground. No reading, defective sensor.

**SENSOR SHORT TO GROUND TEST                      Set Meter:        SEN – 5**

Crank engine with black probe to stator ground and red probe to A, B, C, then D. Any meter reading means sensor is shorting to ground.

Reconnect 4-wire connectors and proceed with Power Pack Test.

**POWER PACK OUPUT TEST                      Set Meter:        NEG – 500**

Disconnect 4-wire connector (or individual leads) from pack to coils. Connect piggy-back jumpers from A to A, B to B and C to C (or reconnect individual leads with TS-77 terminal extenders). Connect black probe to stator ground, red probe to jumper at A or to terminal extender.

Crank engine. Meter should read:	3 cylinder	230
	V-6 pre-1985	170
	1985	175
	1986-88 150-175	175
	1986 & 1987 200-225	100

Repeat test for remaining outputs (terminals B & C in 4-wire connectors).

If reading okay but still no spark, check ignition coil(s).

If reading low, remove jumper (or terminal extender) and connect probe directly to connector (or turn off switch on adaptor).

If reading still low, pack is defective.

If reading okay, check ignition coil(s). If coil(s) okay, pack is defective.

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## V-8 through 1987

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The V-8 ignition system has two identical power packs, the port side for top cylinders 1-4 and the starboard side for cylinders 5-8. Both should be tested in the same way.

This test procedure is for engines which are hard to start or will not start. See service manual for engines which have a high speed miss or run inconsistently above cranking speed.

### VISUAL INSPECTION

Check wiring for broken, pinched or loose leads, connector misalignment, etc.

### SPARK TEST

Remove high tension leads from spark plugs and connect to spark checker. Set gap to 7/16". Install emergency ignition cutoff switch cap and lanyard. Crank engine.

If spark jumps each gap alternately, ignition system is okay. Check spark plugs and other engine systems.

If no spark or poor spark on all cylinders, see stop circuit test in service manual.

If no spark on cylinders 5 through 8, see shift switch elimination test in service manual.

### CHARGE COIL SHORT TO GROUND TEST

**Set Meter:**

**Neg – 500**

Disconnect 2-wire connector between stator and pack. Connect black meter probe to engine ground, red probe to cavity A of stator connector. Crank engine and observe meter. Repeat with red probe to cavity B.

If there is any reading, the charge coil or its leads are grounded. Repair ground or replace stator assembly.

### CHARGE COIL OUTPUT TEST

**Set Meter:**

**NEG – 500**

Connect black meter probe to cavity A, red probe to cavity B of stator connector. Crank engine. If meter reads 130 or higher, continue with sensor tests.

If reading is below 130, check component wiring and connectors. Refer to service manual for charge coil resistance tests.

### SENSOR COIL SHORT TO GROUND TEST

**Set Meter:**

**SEN - 5**

Disconnect 5-wire connector between armature plate and pack. Connect black meter probe to engine ground, red probe to cavity A of armature connector. Crank engine and observe meter. Repeat test with red probe to cavities B, C, D & E.

Any reading means sensor coils or their leads are grounded. Locate ground and repair or replace timer base assembly.

### SENSOR COIL OUTPUT TEST

**Set Meter:**

**SEN – 5**

Connect black meter probe to cavity E of armature connector, red probe to cavity A. Crank engine. Repeat with red probe to cavities B, C & D.

If meter reads .3 or higher on all tests, continue with power pack output test.

If reading is below .3, check component wiring and connectors. Refer to service manual for sensor coil resistance tests.

### POWER PACK OUTPUT TEST

**Set Meter:**

**NEG – 500**

Remove primary leads from ignition coils. Attach TS-77 terminal extenders and reconnect primary leads. Connect meter black probe to engine ground. Connect red probe to exposed part of terminal extender. Crank engine. Repeat with red probe to each output.

If reading is 100 or higher, pack is okay.

If reading is below 100, remove primary lead from terminal extender and connect red probe directly to lead.

Crank engine.

Reading 100 or higher, check ignition coil(s). Coil(s) okay, pack is defective.

Reading below 100, check condition of primary wire and spring clip. Wire and clip okay, pack is defective.

Remove terminal extenders and reconnect primary leads to coils. Make sure all connectors are firmly connected and wires and leads are properly routed.

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## 1987-90 2.5, Ultra 4, Excel 4

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Note: Cranking output tests must be performed with spark plugs installed and torqued to proper specs.

### SPARK TEST

Remove high tension leads from both spark plugs and connect to spark checker gapped at 3/8". Crank engine.

If spark jumps each gap alternately, ignition system is okay. For high speed or intermittent problem see service manual. If there is no spark or poor spark, go to stop button elimination test in manual.

### SENSOR COIL GROUND TEST                      Set Meter:        SEN – 5

Disconnect sensor leads from pack. Connect meter black probe to engine ground. Connect red probe to one of the sensor leads and crank engine. Repeat with red probe connected to other sensor lead.

Any reading on either test indicates a grounded sensor coil or lead. Locate and repair ground or replace sensor coil as required.

### SENSOR COIL OUTPUT TEST                      Set Meter:        SEN – 5

Connect meter red probe to one sensor lead and black probe to other sensor lead. Crank engine. Reverse leads and repeat test. Meter should read 4 volts or higher on both tests. If not, check condition of wiring and connectors. If okay, make sensor coil resistance test. See manual.

### POWER PACK OUTPUT TEST                      Set Meter:        NEG – 500

Remove primary leads from ignition coils. Install TS-77 terminal extenders and connect primary leads to extenders. Connect meter black probe to engine ground. Connect red probe to metal part of extender on #1 ignition coil. Crank engine and read meter. Repeat with red probe connected to extender on #2 ignition coil.

Reading should be 125 volts or higher on both tests.

If reading is low, remove primary lead(s) from extender. Connect red probe to spring clip in boot of primary leads. Crank engine and take a reading.

If reading is 125 volts or higher check ignition coil. If reading is low, check spring clip in boot and primary wire. If these are okay, replace pack.

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## 1989 – 90 2 cylinder CD2 UL (Pack under flywheel)

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Note: Cranking output tests must be performed with spark plugs installed and properly torqued.

### SPARK TEST

Remove high tension leads from both spark plugs and connect to spark checker. Set gap to 1/2". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

If spark jumps each gap alternately, ignition is okay. See note below.

If there is no spark, go to stop circuit test in manual.

If there is spark on one cylinder go to output test.

Note: See service manual for running test if high speed or intermittent problem exists. Also, ignition system may have good output and still have a problem. See manual for other possible sources of ignition trouble.

### OUTPUT TEST    Set Meter:        POS – 500

Remove primary leads from ignition coils. Connect PL-88 load adaptor red clip to #1 primary lead and black clip to engine ground. Connect red meter probe to adaptor red lead and black probe to engine ground. Crank engine. Repeat with PL-88 and meter at #2 primary lead. Readings should be 175 volts.

If both outputs are okay, test ignition coils.

If one lead has no output, replace ignition module.

If both leads have no output, make charge coil resistance test. See manual.



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## 1989-90 3 cylinder

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Note: Cranking output tests must be performed with spark plugs installed and properly torqued.

### SPARK TEST

Remove high tension leads from spark plugs and connect to spark checker. Set gap to 1/2". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

If spark jumps each gap, ignition is okay. See note below.

If there is good spark on at least one cylinder, go to sensor coil test.

If there is no spark, go to stop circuit test in manual.

Note: See service manual for running test if high speed or intermittent problem exists. Also, ignition system may have good output and still have a problem. See manual for other possible sources of ignition trouble.

### CHARGE COIL GROUND TEST                      Set Meter:      Pos – 500

Disconnect 5-wire connector between stator and pack. Connect black meter probe to engine ground and red probe to terminal A of stator connector. Crank engine. Repeat with red probe connected to terminal B.

Any reading on either test indicates charge coil is shorted to ground. Locate and repair ground or replace stator.

### CHARGE COIL OUTPUT TEST                      Set Meter:      POS – 500

Connect black meter probe to terminal A of stator connector, red probe to terminal B. Crank engine. Reading should be 250 volts or higher.

If okay, go to sensor coil test.

If below 250, check wiring and connectors.

If wiring and connectors are okay, make charge coil resistance test. See manual.

### SENSOR COIL GROUND TEST                      Set Meter:      SEN – 5

Disconnect 4-wire connector between timer base and pack. Connect black meter probe to engine ground. Connect red probe to timer base connector terminal A. Crank engine. Repeat with red probe connected to terminals B, C & D.

Any reading indicates sensor coils or leads are grounded. Locate and repair ground or replace timer base.

### SENSOR COIL OUTPUT TEST                      Set Meter:      SEN - 5

Connect meter black probe to timer base connector terminal D. Connect red probe to terminal A. Crank engine. Repeat with red probe connected to terminals B and C.

Reading .3 V or higher, go to power pack test.

Reading below .3, check wiring and connectors. If wiring and connectors okay, make sensor coil resistance test. See manual.

### POWER PACK TEST                      Set Meter:      POS - 500

Remove primary leads from ignition coils. Connect Stevens PL-88 load adaptor red clip to #1 primary lead and black clip to engine ground. Connect meter red probe to adaptor red lead and black probe to engine ground. Crank engine. Repeat with PL-88 and meter connected to numbers 2 & 3 primary leads.

If reading is 230 or higher, check ignition coils.

If one lead has no output, replace power pack.

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## 1989-90 Cross V

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Note: Cranking output tests must be performed with spark plugs installed and properly torqued.

### SPARK TEST

Remove high tension leads from spark plugs and connect to spark checker. Set gaps: V-4 – 1/2", V6 – 7/16". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

If there is good spark on all cylinders, ignition system is okay. See note below.

If there is good output on at least one cylinder.....V4 go to Sensor Coil Test, V6 go to Charge Coil Test.

If there is no spark, go to stop circuit test in manual.

Note: See service manual for running test if high speed or intermittent problem exists. Note also that the ignition system may have good output and still have a problem. See manual for other possible sources of ignition trouble..

**CHARGE COIL GROUND TEST**

**Set Meter:**

**POS - 500**

Separate connector between stator and pack:

Connect meter black probe to engine ground, red probe to:

V4	2-wire	A, then B
V6 (9A)	4-wire	A, then B, C & D
V6 (35A)	6-wire	A, then B, C & D

Crank engine with red probe at each connection.

Any reading indicates charge coil is grounded. Locate and repair ground or replace stator assembly.

**CHARGE COIL OUTPUT TEST**

**Set Meter:**

**POS - 500**

Using same connectors as above, connect meter black probe to terminal A, red to B. On V6, repeat with black to C, red to D. Crank engine.

Reading should be 150 on V4, 200 on V6.

If okay, go to sensor coil test.

If low, check wiring and connectors. If wiring and connectors okay, make charge coil resistance test. (See manual)

**SENSOR COIL GROUND TEST**

**Set Meter:**

**SEN - 5**

On V6 9 Amp, disconnect timer base ground lead from powerhead and isolate.

Separate connector between timer base and pack:

Connect meter black probe to engine ground, red to:

V4	5-wire	A, then B, C, D & E
V6 9 Amp	6-wire	A, then B, C, D, E & F
V6 35 Amp	two 4-wires	A, then B, C & D on both connectors

Crank engine with red probe at each terminal. Any reading indicates sensor coils or leads are grounded. Locate and repair ground or replace timer base.

**SENSOR COIL OUTPUT TEST**

**Set Meter:**

**SEN - 5**

Using same connectors as above, connect meter probes:

Reading

V4	Black to E, Red to A, B, C, & D	.3
V6 9 Amp	Black to timer base ground lead, Red to A, B, C, D, E, F	.2
V6 35 Amp	Black to port timer base connector D, Red to A, B, C	.2
	Repeat for starboard	

Additional test for V6 35 Amp. Connect jumpers between D terminals of port connector and between D terminals of starboard connector. Connect black meter probe to engine ground. Connect red probe to A, B & C of port and starboard connectors, cranking each time. Reading should be 1.2.

If readings okay, go to power pack test.

If low, check wiring and connectors. If wiring and connectors okay, make sensor coil resistance test. (See manual)

**POWER PACK TEST**

**Set Meter:**

**POS - 500**

Remove primary leads from ignition coils. Connect Stevens PL-88 load adaptor red clip to #1 primary lead and black clip to engine ground. Connect meter red probe to adaptor red lead and black to engine ground. Crank engine. Repeat with PL-88 and meter connected to remaining primary leads.

Readings should be 150 for V4 and 175 for V6.

If okay, check ignition coils.

If one primary lead has no output, replace power pack.

