



## MODEL CD-77 PEAK READING VOLTMETER

### General Information

The CD-77 is a peak reading voltmeter designed specifically for testing CD ignition systems. The meter has 3 scales: 0-5, 0-50, and 0-500, corresponding to the three 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 meter protection circuit; however, *if the needle swings hard against the right end of the scale, or if the needle vibrates against the left end of the scale, disconnect or stop cranking as quickly as possible and recheck switch settings and connections.*

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 models, so you may expect unusually high readings on some, but not all, engines. This is okay as long as readings meet the minimum spec. Some manuals call for testing sensors on the POS position. This is intended for meters which do not have a sensor position; continue to use SEN position on the CD-77 for all Sensor tests.

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

Using one of the Stevens adapters precludes the need for jumpers on most engines. Remember that switch positions on SA-77, SA-5 & SA-6 adapters, 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 specifications are available. In addition, the following instructions cover all basic types of OMC CD systems, from early battery CD to the present.

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## BATTERY CD

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

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

### 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 the 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, crack on sensor face, etc.<br><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><br>Disconnect wire between pack and points. With key switch on, touch amplifier connector to ground intermittently. No reading, pack is bad.<br><br>Reading okay, trouble is in breaker point circuit. |

## PACK TERMINAL SYSTEMS

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 tape. **Battery must be fully charged before testing.**

### SPART TEST

Remove high tension spark plug leads at 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.

Weak, erratic, or no spark from one coil → go to sensor test.

Weak or erratic spark from ALL coils → go to charge coil test.

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 key switch lead. Repair problem and go to Sensor Test.

## CHARGE COIL OUTPUT TEST

Set Meter: NEG - 500

Power Pack II

Power Pack III

Power Pack IV

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

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

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.

Reading okay → charge coils okay

Reading low → check resistance of charge coils

Resistance out of spec. → replace charge coils

Resistance okay → replace flywheel

Power Pack II

Power Packs III and IV

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

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.

No meter reading on both checks → charge coils are okay. Go to Sensor Test.

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

Power Pack III

Power Pack IV

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

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

Remove sensor leads from terminals 2, 4, 9 & 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 & 12 and repeat above steps.

Reading okay → continue with Short to Ground Test.

Reading low → check sensor resistance.

Low resistance → replace sensor.

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.

No reading → continue with Power Pack Output Test.

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)

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

Reading low → pack defective.

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.





1985 and later: 2-cylinder & V-4 have direct connections. Use TS-77 terminal extenders to connect pack and coils and provide a test point.

<u>To Test</u>	<u>Connect Jumpers</u>	<u>Meter leads to*</u>	<u>Reading</u>
2-cylinder, pre-1985	B to B, C to C	Red to B, repeat to C	180
‘85 and later	N/A	Red to each output	200
V-4, pre-1985	A to A, B to B	Red to A, repeat to B	160
1985 & later dual packs	N/A	Red to each output	150
single pack	N/A	Red to each output	175

\*black to ground on all engines

Reading okay but no spark → check coil(s)

Reading low → check with no load (coils disconnected)

    Reading still low → pack is defective

    Reading okay → check ignition coils. If coils are okay, pack is defective.

### **3 & 6 cylinder through 1988 except 1988 Loop V**

#### **VISUAL INSPECTION**

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

#### **SPARK TEST**

Remove high-tension spark plug leads at spark plugs and connect to spark checker. Set gap on spark checker to 1/2" for 3-cylinder,  $\frac{7}{16}$ " for 6-cylinder. Crank engine.

    Spark jumps each gap alternately → ignition system is okay. Check spark plugs and other systems.

    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 red meter probe in cavity B and Black probe in cavity A of connector from stator.

Crank engine. Meter should read:

3-cylinder pre-1985	220
3-cylinder 1985 and later	250

6-cylinder pre-1985		160
6-cylinder 1985 and later	150-175	200
	200-225	130

- Reading okay → check for short to ground
- No reading → replace charge coil
- Low reading → check resistance of charge coil
  - Low → replace charge coil
  - Okay → replace flywheel

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

Using same connectors above, connect black meter probe to armature plate ground and 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 the 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
	1986-88	.3
	V-6 pre-1985	.25
	V-6 1985 and later, 150-175	.2
	200-225	.3

- 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 strator 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 Pack Test.

**POWER PACK OUTPUT 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 terminal extenders, TS-77). 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).

Reading okay but still no spark → check ignition coil(s)

Reading low → remove jumper (or terminal extender) and connect probe directly to connector (or turn off switch on adapter).

Reading still low → pack is defective

Reading okay → check ignition coil(s). Coil(s) okay → pack is defective.

## **V-8 Through 1987**

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

This test procedure is for engines that are hard to start or will not start. See service manual for engines which have 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.

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

No spark or poor spark on all cylinders → see stop circuit test in service manual.

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.

Meter reads 130 or higher → continue with sensor tests.

Meter reads below 130 → check component wiring and connectors. Refer to service manual for charge coil ohmmeter 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 and red probe to cavity A of armature connector. Crank engine and observe meter. Repeat test with red probe to cavities B, C, D, and 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 in cavity E of armature connector and red probe to cavity A. Crank engine. Repeat with red probe to cavities B, C, and D.

Meter reads .3 or higher on all tests → continue with power pack output test.

Reading is below .3 → check component wiring and connectors. Refer to service manual for sensor coil ohmmeter tests.

### **POWER PACK OUTPUT TEST**

Set Meter: NEG - 500

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

Reading is 100 or higher → pack is okay.

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 wire and leads are properly routed.

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

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

### **SPARK TEST**

Remove high-tension leads from both spark plugs and connect to spark gap tester. Adjust gap to  $\frac{3}{8}$ ". Crank engine.

Spark jumps each gap alternately → ignition system is okay. For high-speed or intermittent problem, see service manual.

No spark or poor spark → go top stoop button elimination test in manual.

### **SENSOR COIL GROUND TEST**

Set Meter: SEN - 5

Disconnect sensor leads from pack. Connect black meter 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 rounded sensor coil or lead. Locate and repair ground or replace sensor coil as required.

### **SENSOR COIL OUTPUT TEST**

Set Meter: SEN - 5

Connect red meter 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: SEN - 5

Remove primary leads from ignition coils. Install terminal extenders and connect primary leads to extenders. Connect black meter 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 V or higher on both tests.

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.

Reading is 125 V or higher → check ignition coil.

Reading is low → check spring clip in boot and primary wire. If these are okay, replace pack.

## **1989-90 2-Cylinder CD2 UL (Pack under flywheel)**

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

## **SPARK TEST**

Remove high-tension leads from both spark plugs and connect to spark tester. Set gap to ½". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

Spark jumps each gap alternately → ignition is okay. See note below.

No spark → go to stop circuit test in manual.

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 adapter red clip to #1 primary lead and black clip to engine ground. Connect red meter probe to adapter 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.

Both outputs are okay → test ignition coils.

One lead has no output → replace ignition module.

Both leads have no output → make charge coil resistance test. See manual.

## **1989-90 3-Cylinder**

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 tester. Set gap to 1/2". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

Spark jumps each gap → ignition is okay. See note below.

Good spark on at least one cylinder → go to sensor coil test.

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 and red probe to terminal B. Crank engine. Reading should be 250 volts or higher.

Reading okay → go to sensor coil test.

Reading below 250 → check wiring and connectors.

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, and 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 black meter 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 .3V or higher → go to power pack test.

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

## **POWER PACK TEST**

Set Meter: POS - 500

Remove primary leads from ignition coils. Connect Stevens load adapter PL-88 red clip to #1 primary lead and black clip to engine ground. Connect red meter probe to adapter red lead and black probe to engine ground. Crank engine. Repeat with PL-88 and meter connected to numbers 2 & 3 primary leads. Reading is 230 or higher → check ignition coils.

One lead has no output → Replace power pack.

## **1989-90 Cross V**

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 tester. Set gaps: V4: 1/2", V6: 7/16". If equipped, install emergency ignition cutoff switch clip and lanyard. Crank engine.

Good spark on all cylinders → ignition system is okay. See note below.

Good output on at least one cylinder → V4: go to Sensor Coil Test. V6: go to Charge Coil Test.

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 black meter probe to engine ground and red probe to:

V-4                      2-wire

A, then B

V6 (9A)                4-wire

A, then B, C, and D

V6 (35A)              6-wire

A, then B, C, and 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 the same connectors as above, connect black meter probe to terminal A and red to B. On V6, repeat with black to C and red to D. Crank engine. Reading should be 150 on V4, 200 on V6.

Reading is okay → go to sensor coil test

Reading is low → 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

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

Separate connector between timer base and pack:

Connect black meter probe to engine ground and red to:

V4                      5-wire

A, then B, C, D, and E

V6 (9 Amp)            6-wire

A, then B, C, D, E, and F

V6 (35 Amp)         two 4-wires

A, then B, C, and 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 the same connectors as above, connect meter probes:

Reading:

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

Additional test for 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, and C of port and starboard connectors, cranking each time. Reading should be 1.2.

Readings are okay → go to power pack test.

Readings are low → check wiring and connectors. If wiring and connectors are okay, make sensor coil resistance test (see manual).

## POWER PACK TEST

Set Meter: POS - 500

Remove primary leads from ignition coils. Connect Stevens load adapter PL-88 red clip to #1 primary lead and black clip to engine ground. Connect red meter probe to adapter 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.

Reading is okay → check ignition coils

One primary lead has no output → replace power pack

## 1988-90 Loop V

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 gap tester. Set gap to 7/16". If equipped, install emergency ignition cutoff switch and lanyard. Crank engine.

Good spark on all cylinders → ignition system is okay. See note below.

Good output on at least one cylinder → V4: Go to Sensor Coil Test. V6 and V8: Go to Charge Coil Test.

No output on V6 cylinders 1, 3, and 5 or on V8 cylinders 5 through 8 → go to Shift Switch Test in manual.

No output whatsoever → go to Stop Circuit Test in manual.

Note: See service manual for running test if high speed or intermittent problem exists. Also, 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 2-wire connector (two connectors on V6 and V8). Connect black meter probe to engine ground. Connect red probe to A, then B (both connectors on V6 and V8). Crank engine with red probe at each connection. Any reading indicates that the charge coil is grounded. Locate and repair ground or replace stator assembly.

