EICCT TECHNOLOGY

FINAL COAT MODULE

TEST SUMMARY

The Ohio State
ElectroScience Laboratory

Test Report
Measurement of Surface Current On a Typical Automobile Created by Canadian Auto Preservation Device

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Report 746284-1

Introduction

This report summarizes measurements and presents results on a measurement of surface currents on a car that were generated by the "Final Coat Module" (the "Module") supplied by Canadian Auto Preservation, Incorporated. This device is intended to reduce the rate of corrosion on automobiles. The purpose of this study was to determine whether currents generated by the Module were, in fact, distributed over the entire surface of an automobile.

As outlined in greater detail below, the Module was installed on a 1994 Buick Century automobile in accordance with the written instructions accompanying the Module. The surface current was measured using a radio receiver tuned to the strongest frequency component of the device output, at a large number of locations over the entire vehicle.

Installation

Figure 1 shows a photograph of the device as it was mounted on a plastic trim piece under the front part of the hood of the Buick Century. The device was taped on with duct tape. This rather temporary approach was strong enough to allow the car to be driven for several days with the device in place. In the photo, the front of the car is to the right. The module is taped to a plastic panel above the radiator next to the forward motor mount bracket. The radiator fill cap can be seen just behind the module as it comes up from the radiator.

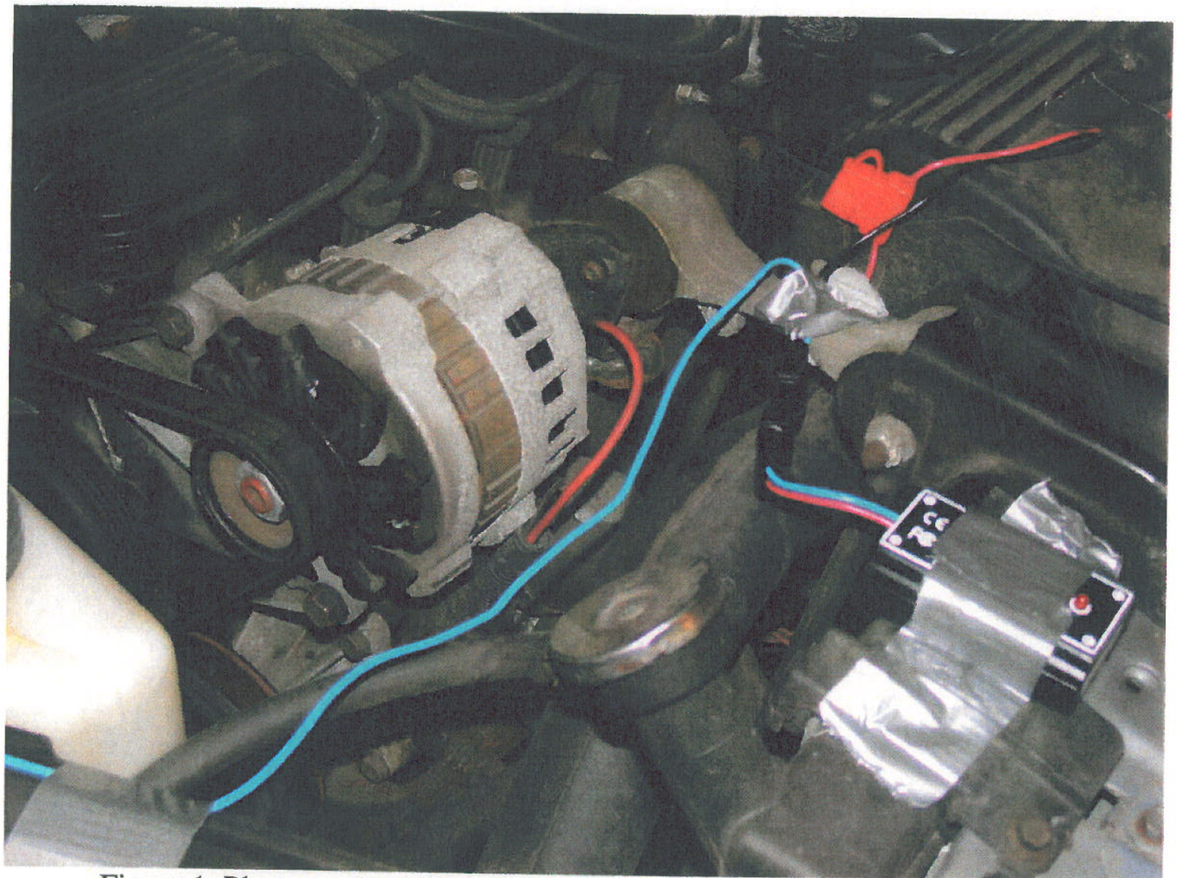

Figure 1. Photograph of the module mounted in the car

The ground wire (black) was mounted to a ground bolt on the driver's side of the front engine compartment interior body panel, just ahead of the battery. This configuration is shown in Figure 2. In this photo, the front of the car is upper left, and the edge of the front fender appears in the lower left corner. The hood support rubber bumper is in the upper center of the photo. The module ground wire is marked by the blue sleeve. The car battery top is just visible in the lower right corner of the picture.

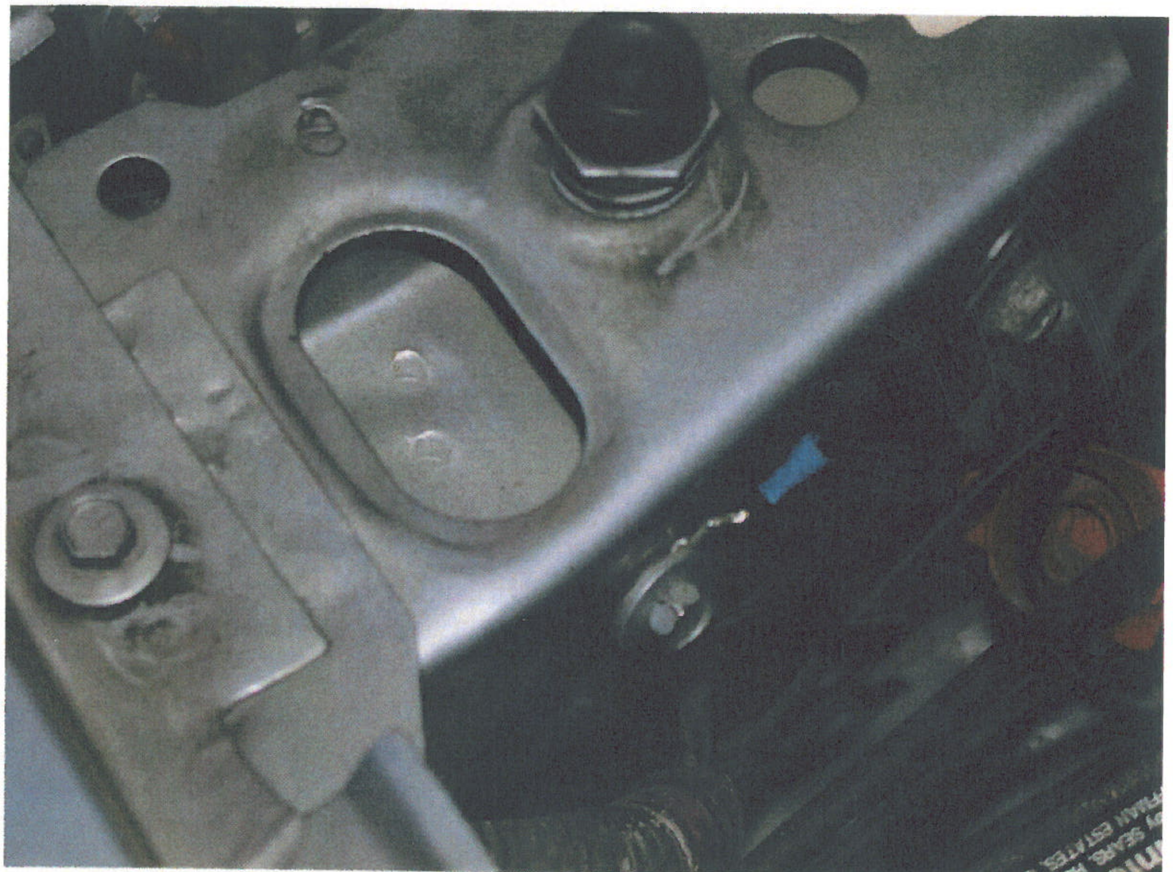

Figure 2. Photograph of the module ground wire connection point on the car

The output wire (blue wire) was stretched out diagonally over the top of the engine and connected to a passenger side front fender body panel bolt that sits just under the edge of the hood back near the windshield cowl on the passenger side. This mounting is shown in Figure 3. In this photo, the front of the car is at the bottom of the picture. The passenger side front fender panel is in the left side of the picture. The edge of the hood comes down to cover this bolt and fender flange when it is closed. A rubber support bumper for the rear corner of the hood is in the upper center of the picture.

When this was first done, we discovered that 10 years of rust and corrosion in this car was not giving a good connection. However, some burnishing of the bolt and the threads on the body panel did result in a good connection, and shown by measurements on the blue wire that showed a peak (pulsed) current of 5 amps going through the blue wire when it was properly connected.

Figure 3. Photo of module output wire connection to the car

Preliminary Measurements

A 1 ohm resistor was placed in series with the blue wire, and its voltage was measured with an oscilloscope when the device was turned on. The formula is Voltage = amps X resistance in ohms. So a 1 volt signal on the oscilloscope shows 1 amp of current on the signal wire. The oscilloscope showed a pulsed signal that contained a spectrum of many frequencies extending up to several MegaHertz (MHz), and the strongest components were around 1.7 to 1.9 MHz.

Next, we utilized a radio receiver with a calibrated loop current probe as the antenna, and this receiver was tuned to the strong signal frequency. The frequency used in this test was 1.8273 MHz. The radio receiver was a model IC-R70 Communications Receiver, manufactured by ICOM Incorporated of Osaka, Japan. The receiver was tuned to 1.8273 MHz on Lower Sideband, with the RF and audio gain knobs set to maximum sensitivity. A photograph of the receiver in use is shown in Figure 4. In this picture, the tuned frequency is just barely visible in the top number read-out. Also note the S-meter in the top left center of the radio display. The needle points to +20 dB, and this is a typical reading for several stronger current probe locations.

Figure 4, Photo of the receiver in use

In the lower left corner of Figure 4, the photo shows an oscilloscope probe attached to the phone jack of the receiver. When this was done, the oscilloscope would display a picture of the strong sinusoidal tone that we were listening to when the surface current was sensed. This display is shown on the oscilloscope in Figure 5.

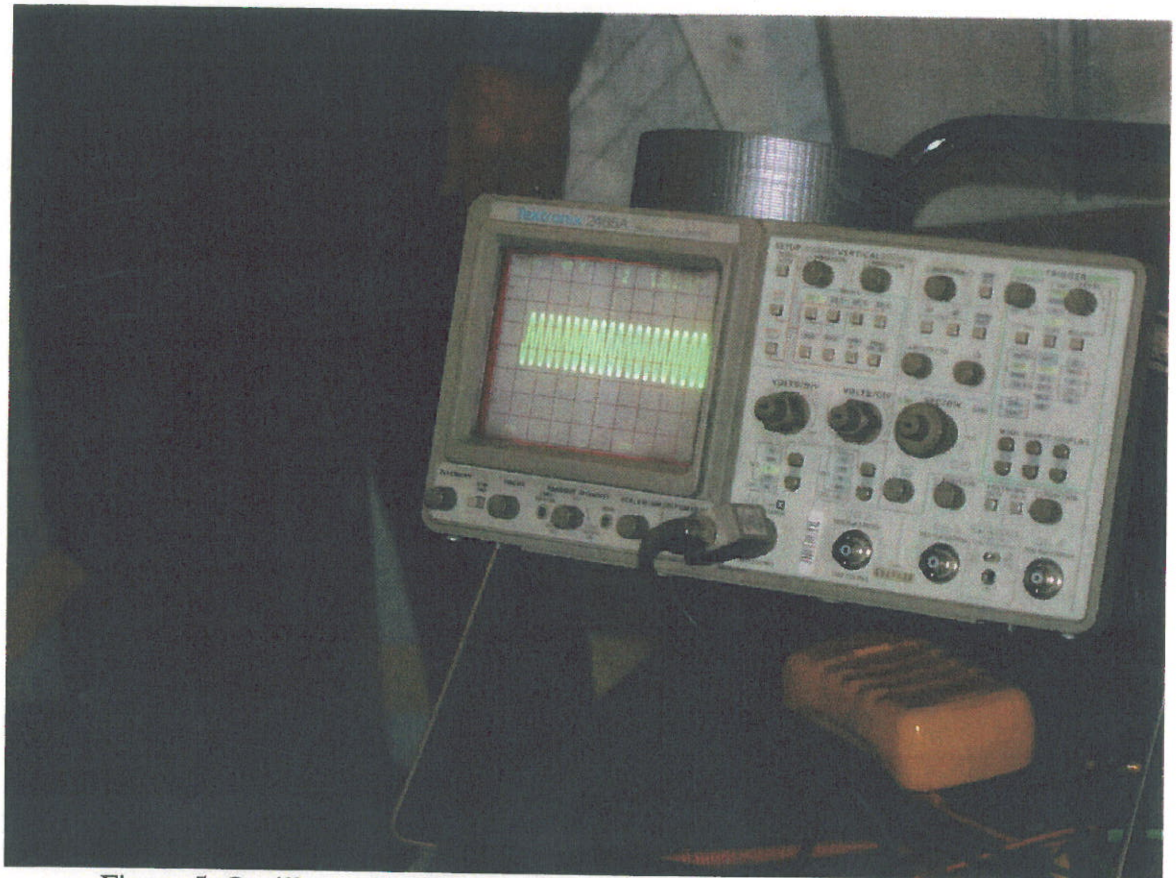

Figure 5. Oscillosccope display of the sinusoidal tone from the receiver

It was decided to use a second loop antenna with a ferrite core for the surface current measurements. This current sensor could be placed closer to the surface and was more sensitive to the device signal than the original single-turn loop. The sensitivity of the ferrite loop was compared or (calibrated) to the original loop by measuring its signal near the blue signal wire just as had been done for the single turn loop. The device signal produced a sinusoidal tone of about 600 cycles (about "symphony A" which was comfortable to hear and distinctive to hear) out of the radio receiver.

Having completed preliminary measurements, the hood of the car was closed and the device turned on. The measurement was made inside a garage room out of the weather. This was not a perfectly shielded room. There was some radio noise that could be heard when the device was not on. Also, noise was heard when the current sensor loop was further than 2 meters from the car in any direction or location. Schedule "A" contains a list of the various locations on the vehicle where test measurements were conducted.

Final Measurements

The current sensor coil was placed against the body surface in 58 locations on all sides and top and bottom of the car. Figure 6 shows a photograph of the sensor in position at the center of the car roof. This is a typical situation. In every case, the orientation of the sensor was rotated until a maximum strength tone was sensed, and the presence of an audible tone was then recorded.

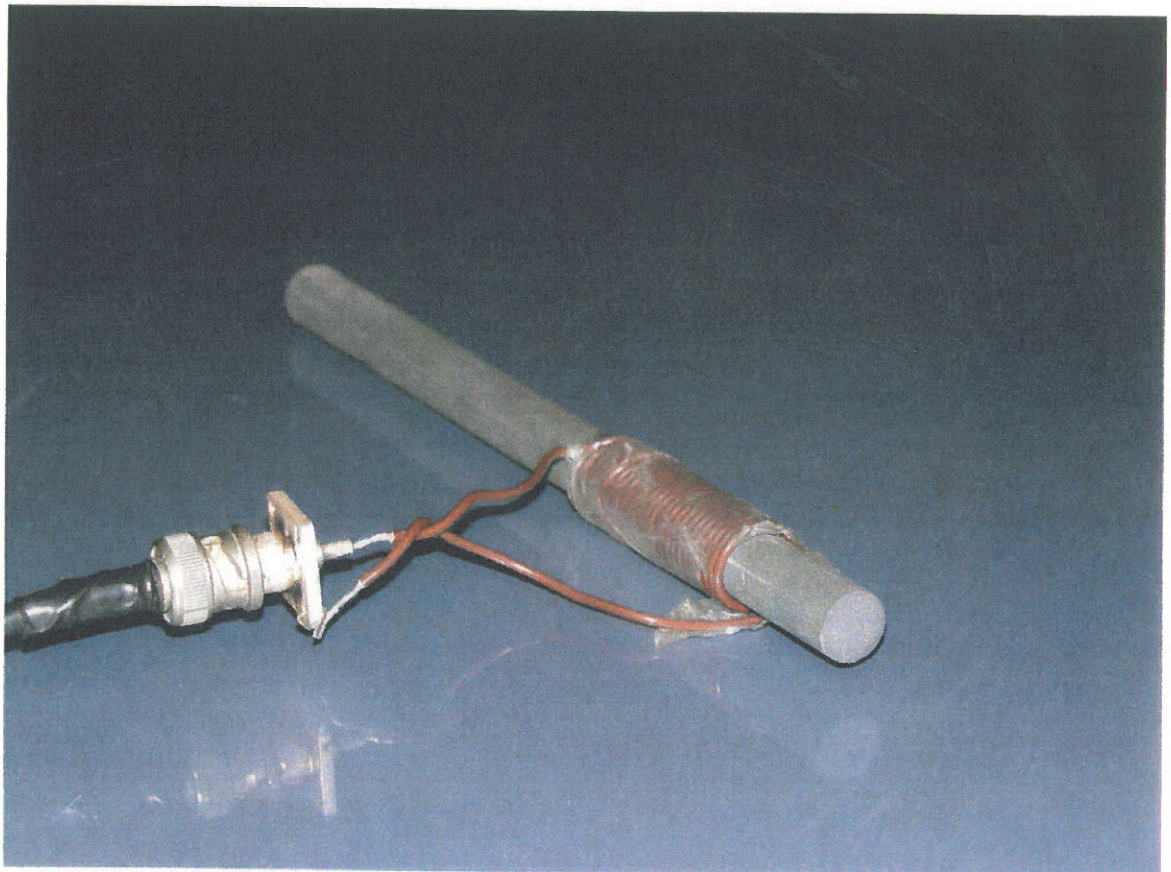

Figure 6. Photo of the surface current sensor positioned on the car roof

The fact that the loop could be oriented so that the tone was maximum, or rotated to null out the tone was regarded as an appropriate check against the adequacy of the results. This is the way that loop surface current sensors are supposed to work. When the loop ferrite core is perpendicular to the current direction the signal is maximum, because this is when the loop is aligned with the magnetic field associated with the radio frequency current. When the loop is cross-polarized to the magnetic field of the surface current, its signal should be virtually zero.

Another check was done for several of the sensing locations. The car hood was opened and the device was turned off. In all these cases, the sinusoidal tone from the radio receiver stopped instantly.

Comments on the measurement locations

Note that these locations cover the total surface area of the car with a maximum spacing of 3 ft. between test points. Remember also that the radio signal being received is 1.8273 MHz, which has a wavelength of 182.23 meters or 597 ft. The laws of physics and radio wave current propagation state that sampling the surface current at intervals which are this small in wavelengths is well beyond sufficient. At wavelengths this long, the current simply cannot change that drastically between sample points. Therefore, testing the surface currents at spacings of inches, for example, would be a large waste of time.

Summary of Measured Results

The signal from the 1.8273 MHz component of the device output current was sensed on the metal surface of the car at every single location given above with the ferrite loop sensor coil. At every location, the current direction could be sensed and the signal would get much weaker as the probe was taken away from the position resting against the metal surface. Also, at every location where we took the additional step of turning off the device, the tone ceased immediately.

Due to the methodology employed and the repeatability of these results when the probe was rotated back and forth and moved slightly at each test point, both the author of this report and the technicians involved, Mr Jim Moncrief and Mr Hani Darwish, feel that we have reliably and demonstrably sensed surface current all over the surface of this test automobile. We feel that anyone performing this same test with the same equipment would obtain the same result.

Schedule "A" - List of Measurement Locations

1.Hood passenger side, 4 inches from the side and rear edge, back near the passenger windshield cowl

2. Bottom of passenger front fender, in the small space between the passenger front door and the back edge of the front wheel opening

3. Passenger A-post (the post at the edge of the windshield)

4. Passenger B-Post (the post at the edges of the front and back door)

5. Passenger C-Post (the post at the back door and back window)

6. Middle Passenger Front door, 8" down from the window

7. Middle Passenger Back door

8. Middle of back passenger fender

9. Middle back passenger fender, bottom edge

10. Middle back passenger door, bottom edge

11. Middle front passenger door, bottom edge

12. Passenger front fender, above wheel center

13. Front Passenger fender, ahead of front wheel, bottom edge

14. Center of hood, 4" ahead of cowl panel crack

15. Center of hood, 4" from front crack

16. Center of grille

17. Center of front license plate

18. Center of passenger headlight

19. Passenger bumper, 4" toward side from rubber bumper guard

20. Driver headlight

21. Driver bumper, 4" toward side from rubber bumper guard

22. Driver front fender, ahead of wheel, bottom edge

23. Driver front fender, above wheel center

24. Driver side front fender, just ahead of front door

25. Driver front door middle, 8" below window

26. Driver front door middle, bottom edge

27. Driver a-pillar (at edge of windshield)

28. Driver b-pillar (at back of front door and front of rear door)

29. Driver c-pillar (at side of rear window)

30. Middle drivers back door, 8" down from side window

31. Middle driver's back door, bottom of door

32. Driver back fender, bottom edge

33. Middle back driver fender

34. Driver roof rear corner, 8" from rear window and side door

35. Driver roof, above b-pillar, 8" from side door

36. Driver roof front corner, 8" from side and windshield

37. Passenger roof front corner, 8" from side and windshield

38. Passenger roof above b-pillar, 8" from side

39. Passenger roof rear corner, 8" from side and rear window

40. Roof middle, middle (between the b-pillars)

41. Roof middle rear, 8" from rear window

42. Roof middle forward, 8" from windshield top

43. Trunk, passenger side corner, 4" from rear window and trunk side edge

44. Trunk middle, 4" from back window

45. Trunk, driver side corner, 4” from rear window and trunk side edge

46. Passenger trunk, 4” ahead of back edge and from trunk side edge

47. Center trunk, back edge of trunk door top surface

48. Driver trunk, back edge of top, 4” from trunk side edge

49. Trunk rear center (on the lock)

50. Trunk rear passenger side, 4” from side edge

51. Passenger rear bumper, 8” from side

52. Rear bumper center, center of license plate

53. Driver rear bumper, 8” from the edge

54. Noise level check

55. Bottom center of muffler (near rear passenger side under the car)

56. 3 ft forward from rear wheel, under the floor, 18” in from passenger side edge

57. 1 ft behind front wheel, under floor, 18” in from passenger side edge

58. Middle of exhaust pipe (under floor in middle of the car), 1ft. behind front wheel

O.S. ElectroScience Laboratory ... Test Summary

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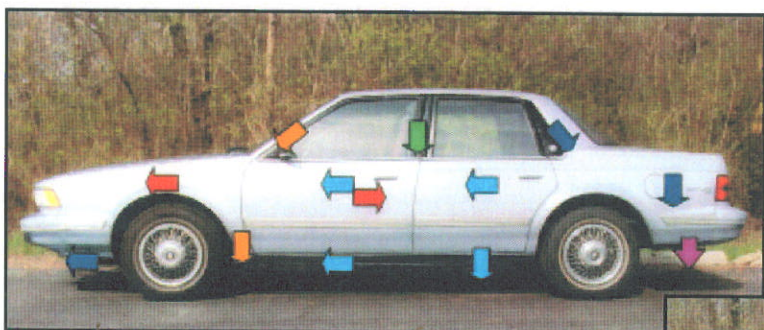
Type of Test: Test was done to show the measurement of "surface current" on a typical automobile by the Final Coat Electronic Corrosion Module

Test Panel Size: 1994 Buick Century Automobile

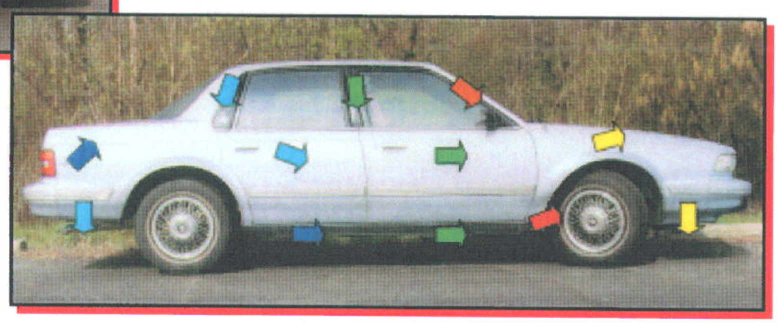
Test Protocol and Overseer: Dr. Jonathan Young

- *Front Currents*

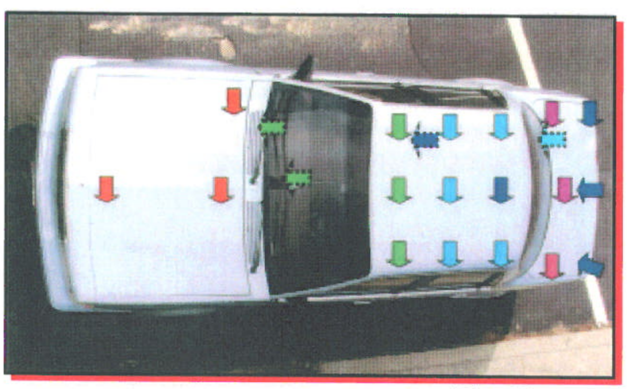
- *Rear Currents*



- *Driver's Side Currents*



- *Passenger Side Currents*



- *Top Currents*

Test Results: "we have reliably and demonstrably sensed surface current all over the surface of this test automobile". Fifty-eight (58) points were measured on the vehicle, from the back to the front, from the top to the bottom.