

Evaluation Report

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Super-Charger 909 Electric Fence Controller

A Co-operative Program Between



SUPER-CHARGER 909 ELECTRIC FENCE CONTROLLER

MANUFACTURER:

International Electric Co.
6809 Harriet Avenue
Minneapolis, Minnesota 55423
U.S.A.

RETAIL OUTLETS:

Peavy Mart Stores and Wheelers Wholesale Ltd.

RETAIL PRICE:

\$72.00 (December, 1981, f.o.b. Humboldt)

SUMMARY AND CONCLUSIONS

The Super-Charger 909 electric fence controller was suitable for use over a wide range of fence conditions.

Peak voltage output on a 5.4 km (3.3 mi) single wire fence varied from 5040 V for a well-insulated, grass-free, dry fence to 850 V for an uninsulated, grass-grown, wet fence. For most normal fence conditions, output was well above the 2000 V minimum guard voltage recommended for long-haired animals, while for extreme conditions, it was above 700 V minimum needed for short-haired animals. For most fence conditions, the Super-Charger 909 could be used without wire insulators on this fence length.

Peak voltage output on a 16 km (10 mi) single wire fence varied from 2320 V for a well-insulated, grass-free, dry fence to 760 V for an uninsulated, grass-grown, wet fence.

Peak current flow through a cow touching well-insulated 5.4 and 16 km (3.3 and 10 mi) single wire fence varied from 1.8 to 1.5 A for a cow standing in water and from 0.91 to 0.53 A for a normally-grounded cow. The high peak current output indicated that the Super-Charger 909 generated quite an intense shock on fairly long or poorly insulated fences.

The Super-Charger 909 was very suitable for cold weather use on feeding fences. Peak voltage output at -35°C on a 5.4 km (3.3 mi) single wire fence was about 3400 V, 33% lower than its output at room temperature.

The Super-Charger 909 did not have CSA approval. No durability problems occurred during testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Submitting the controller to Canadian Standards Association for certification, to comply with regulations in the prairie provinces.

Chief Engineer -- E. O. Nyborg

Senior Engineer -- G. E. Frehlich

Project Technologist -- G. G. Burton

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The Super-Charger 909 has been submitted to the Canadian Standards Association for certification.

NOTE: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX II.

GENERAL DESCRIPTION

The Super-Charger 909 electric fence controller is designed for 115 V AC operation. It is meant to be mounted in a suitable weather-proof enclosure.

The Super-Charger 909 contains solid-state electronics, with no moving parts. A test light is provided to indicate operation.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The performance characteristics of the Super-Charger 909 were determined in the laboratory for a range of simulated fence conditions.* It was evaluated for ease of operation, quality of work, safety and suitability of the instruction manual.

RESULTS AND DISCUSSION

EASE OF OPERATION

Installation: The Super-Charger 909 is equipped with a two-wire cord and a fused plug for connection to a standard, grounded, 115 V AC receptacle. The controller is to be mounted indoors and if mounted outdoors, it must be placed in an appropriate weather-proof shelter.

The controller is connected to the fence with a length of insulated wire. In addition, a suitable ground rod has to be installed and connected to the controller. Depending on ground conditions, a ground rod up to 3 m (10 ft) long may be needed.

Fence Condition: If the fence is in good repair, the controller is designed to operate effectively with a certain amount of plant growth touching the charged wire.

In areas with normal ground conditions, a single charged wire provides a suitable fence. For very dry or frozen soil, which provide poor ground conditions, a two-wire fence, with one charged wire and one ground wire, may be necessary.

Operation: The Super-Charger 909 is equipped with a test light that flashes to indicate that the fence is properly charged. If this light does not flash, it indicates that insufficient charge is being placed on the fence, which may be the result of too long a fence or poor insulation. The bulb could be replaced without disassembly of the controller.

QUALITY OF WORK

General: Operation of an electric fence controller is quite complex. To be effective, an electric fence has to deliver a minimum guard voltage to overcome the insulation resistance of the hide and hair of an animal. In addition, once the insulation resistance of the animal is overcome, the controller must deliver a pulse of electrical energy to the animal to create a shock. The amount of energy (charge) delivered is related to the current flow and its duration. If too much energy is delivered, the fence will be hazardous to both animals and humans while if not enough energy is delivered, animal control will be ineffective.

Little is known about the physiological effect of shock pulses on animals. In general, the following guidelines are used in assessing fencer performance: the minimum guard voltage needed to overcome animal insulation resistance should be at least 2000 V for sheep and for long-haired cattle, such as Herefords or Charolais. For shorter haired animals, such as most dairy cows, a minimum guard voltage of 700 V is sufficient. The shape of the current pulse affects what the animal feels when it touches an electrical fence, but little reliable information is available. It has been found that shock intensity is more related to the peak current value in a pulse than to the total value of the electrical charge.

Fence conditions determine the guard voltage produced by a fence controller and limit the amount of charge, which a controller is capable of delivering to an animal. The insulation resistance of a 1.6 km (1 mi) single wire fence typically varied from about 1 k Ω for an uninsulated, grass-grown, wet fence to well above 500 k Ω for a well-insulated, grass-free, dry fence. The higher the fence insulation resistance, the greater is the length of fence on which a controller can be effectively used. To receive a shock from a single wire electrified fence, an animal must be sufficiently grounded to permit current to flow from the fence, through the animal. Typical electrical resistances of cattle vary from about 0.5 k Ω for a cow standing in water and licking a charged wire to about 4 k Ω for typical ground conditions. If ground conditions are too poor, animal resistance to ground is so great that no shock occurs.

Peak Voltage Output: FIGURES 1 and 2 show peak voltage outputs of the Super-Charger 909 for 5.4 and 16 km (3.3 and 10 mi) lengths of single wire fence over a range of insulation resistances. On a 5.4 km (3.3 mi) fence (FIGURE 1), peak voltage output varied from 5040 V for a well-insulated, grass-free, dry fence to 850 V for an uninsulated, wet fence with considerable grass touching the charged

*PAMI T7850, Detailed Test Procedures for Electric Fence Controllers.

wire. The voltage output was well above the 700 V minimum guard voltage needed for short-haired animals, for all fence conditions, while it was above the 2000 V minimum guard voltage needed for long-haired animals for fence insulation values greater than 1.6 k Ω . From FIGURE 1, it can be seen that the Super-Charger 909 can be satisfactorily used on this length of fence without wire insulators.

On a 16 km (10 mi) fence (FIGURE 2), peak voltage output ranged from 2320 V for a well-insulated, grass-free, dry fence to 760 V for an uninsulated, grass-grown, wet fence. Voltage output was above the 700 V minimum required for short-haired animals for all fence conditions, while it was above 2000 V minimum guard voltage needed for long-haired animals for all fence insulation values greater than 8.5 k Ω .

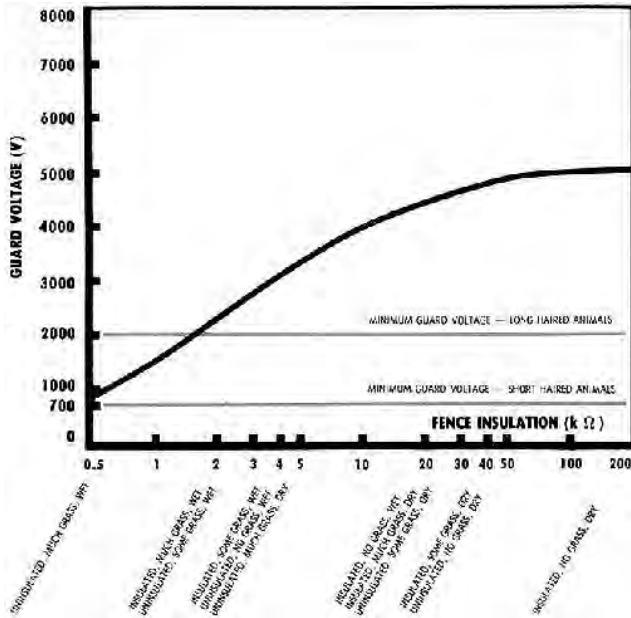


FIGURE 1. Guard Voltage Produced on a 5.4 km Single Wire Fence.

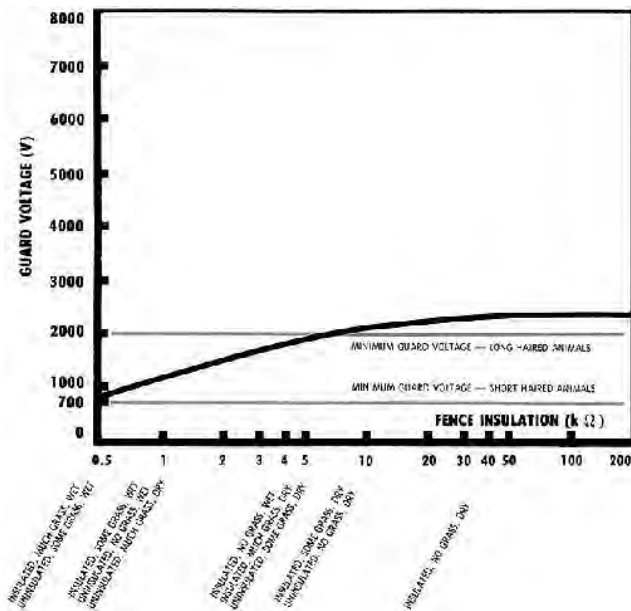


FIGURE 2. Guard Voltage Produced on a 16 km Single Wire Fence.

As can be seen from FIGURES 1 and 2, plant growth touching a fence did not appreciably affect controller performance. The Super-Charger 909 can be expected to operate well over a wide range of fence conditions.

Electrical Charge: FIGURES 3 to 6 show the current output of the Super-Charger 909 when a cow touches 5.4 and 16 km (3.3 and 10 mi) lengths of well-insulated, single wire, fence. FIGURES 3 and 4 are for an animal resistance of 0.5 k Ω , which represent the most extreme condition of a cow standing in water and licking the charged

wire, while FIGURES 5 and 6 are for an animal resistance of 4 k Ω , representing more normal ground conditions. The shock intensity is related to the peak current in the pulse. The higher the peak current, the more intense will be the shock.

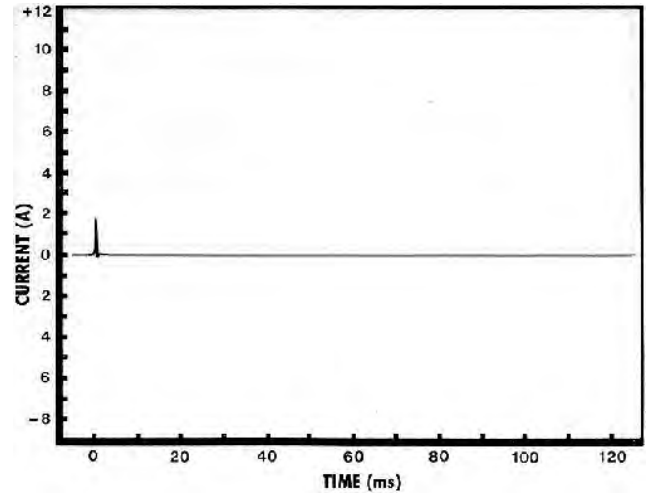


FIGURE 3. Current Delivered to a Well-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

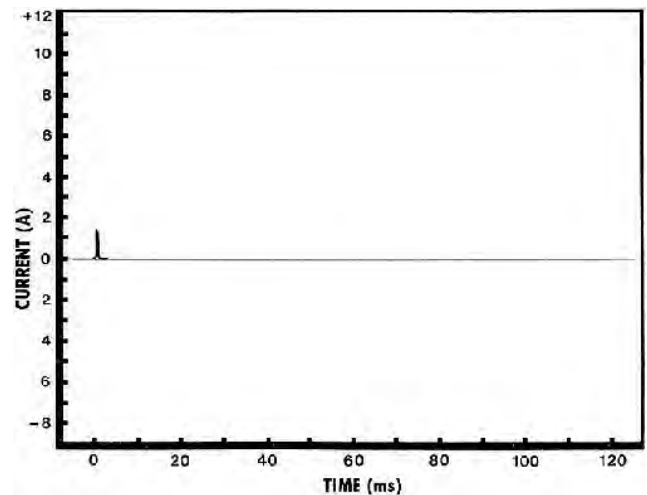


FIGURE 4. Current Delivered to a Well-Grounded Cow Touching a 16 km Well-Insulated Fence.

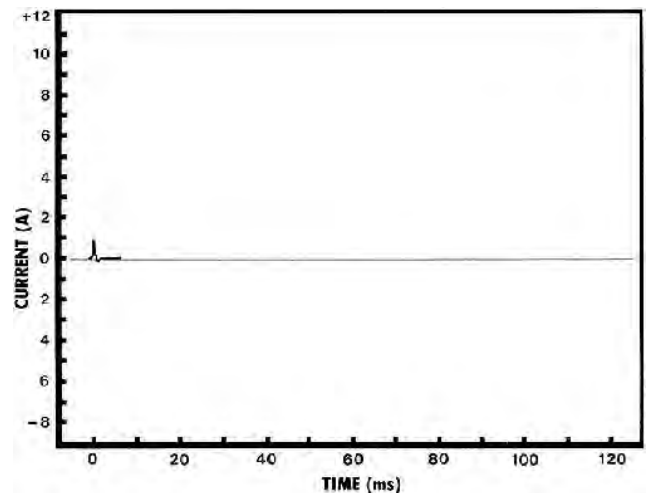


FIGURE 5. Current Delivered to a Normally-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

The peak current delivered by the Super-Charger 909 varied from 1.8 A for a well-grounded cow touching the 5.4 km (3.3 mi) fence to 0.53 A for a normally-grounded cow touching the 16 km (10 mi) fence. The Super-Charger 909 gave quite an intense shock on fairly long or poorly insulated fences.

About 44 charge pulses per minute were delivered. The number of pulses did not vary with fencer load; however, the on-time was affected by load. On-time varied from about 0.75 to 7.62 ms.

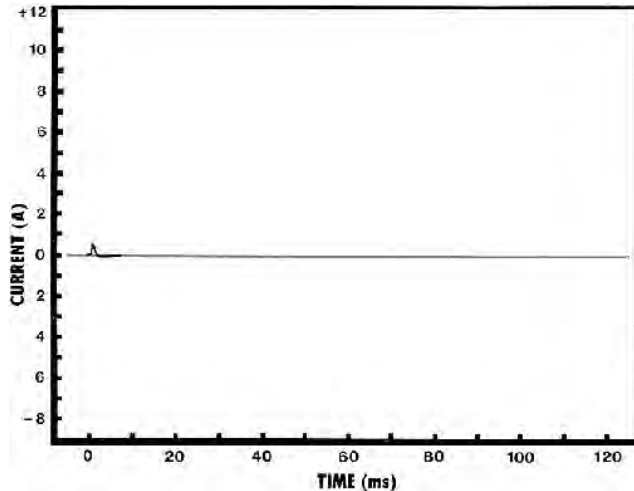


FIGURE 6. Current Delivered to a Normally-Grounded Cow Touching a 16 km Well-Insulated Fence.

Low Temperature Operation: The Super-Charger 909 could effectively be used to energize cattle feeding wires during low winter temperatures. The peak voltage output of the controller at -35°C on a 5.4 km (3.3 mi) single wire fence was about 3400 V, 33% lower than its output at room temperature. Since the peak voltage output was well above the 2000 V minimum required to overcome the insulation resistance of long-haired animals, the Super-Charger 909 was very suitable for feeding enclosures.

As frozen ground is often a very poor electrical conductor, two-wire systems utilizing a separate ground wire are usually most suitable for winter cattle feeding.

SAFETY

No safety problems were evident if the manufacturer's instructions were followed.

The Super-Charger 909 did not have Canadian Standards Association certification. Since CSA certification of power line operated fence controllers is a requirement in the prairie provinces, it is recommended that the manufacturer submit the controller for certification.

INSTRUCTION MANUAL

The instruction manual outlined installation and operation of the fence controller.

DURABILITY RESULTS

The intent of the test was functional evaluation. An extended durability evaluation was not conducted. No problems occurred during functional testing.

APPENDIX I SPECIFICATIONS

| | |
|------------------------------------|---|
| MAKE: | Super-Charger Electric Fence Controller |
| MODEL: | 909 |
| SERIAL NUMBER: | 159888 |
| TYPE: | Solid State Electronic |
| POWER REQUIREMENTS: | 115 V AC |
| WEIGHT: | 3.0 kg |
| OVERALL DIMENSIONS: | |
| -- length | 190 mm |
| -- width | 310 mm |
| -- height | 225 mm |
| NUMBER OF INDICATOR LIGHTS: | 1 (operation indicator) |
| TYPE OF ENCLOSURE: | for indoor use |

APPENDIX II CONVERSION TABLE

| | |
|-------------------|------------------------|
| 1 millimetre (mm) | = 0.04 inches (in) |
| 1 metre (m) | = 3.3 feet (ft) |
| 1 kilometre (km) | = 0.6 mile (mi) |
| 1 kilogram (kg) | = 2.2 pounds mass (lb) |



3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:
P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080