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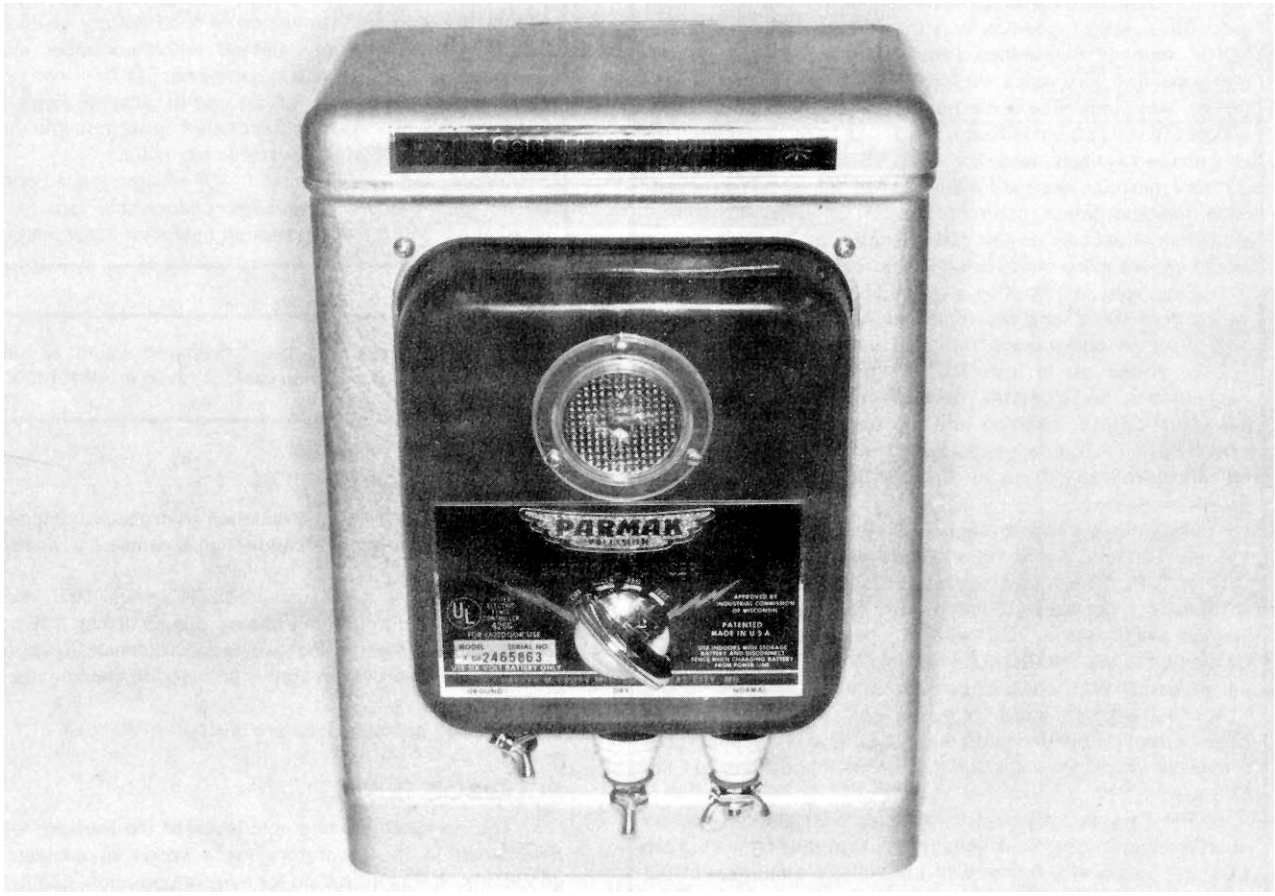

Parmak A-DF Electric Fence Controller

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

PARMAK A-DF ELECTRIC FENCE CONTROLLER

MANUFACTURER:

Parker-McCrory Manufacturing Company
3175 Terrace Street
Kansas City, Missouri 64111
U.S.A.

RETAIL PRICE:

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

DISTRIBUTORS:

Buckerfield's Ltd.
P.O. Box 7000
Vancouver, British Columbia
V6B 4E1

Romco Fencing
103 - 54 - 120th Street
Surrey, British Columbia
V3V 4G2

SUMMARY AND CONCLUSIONS

The Parmak A-DF electric fence controller was suitable for use over a limited range of fence conditions.

Peak voltage output on a 5.4 km (3.3 mi) single wire fence varied from 1240 V for a well-insulated, grass-free, dry fence to 90 V for an uninsulated, grass-grown, wet fence, with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, output varied from 1390 V for a well-insulated, grass-free, dry fence to 70 V for an uninsulated, grass-grown, wet fence. For some normal fence conditions, output was above the 700 V minimum guard voltage recommended for short-haired animals, while for all conditions, it was below the 2000 V minimum needed for long-haired animals. The Parmak A-DF electric fence controller could be used to control short-haired animals on this fence length, but a shorter fence would ensure more effective control for all fence conditions.

Peak voltage output on a 16 km (10 mi) single wire fence varied from 760 V for a well-insulated, grass-free, dry fence to 100 V for an uninsulated, grass-grown, wet fence, with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, output varied from 1030 V for a well-insulated, grass-free, dry fence to 70 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 fences,varied from 0.17 to 0.16 A for a cow standing in water and from 0.14 to 0.11 A for a normally-grounded cow. This occurred with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, peak current output was about 20% less. The peak current output indicated that the Parmak A-DF generated a minimal shock on well-insulated fences longer than 5.4 km (3.3 mi).

The Parmak A-DF was suitable for cold weather use on short feeding fences. Peak voltage output at -35°C on a 5.4 km (3.3. mi). single wire fence, with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal, was about 1350 V, 8% higher than its output at room temperature. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, peak voltage output was about 1560 V, 11% higher than its output at room temperature.

No durability problems occurred during testing.

RECOMMENDATIONS

A need for recommendations was not apparent.

Chief Engineer -- E. O. Nyborg
Senior Engineer -- G. E. Frehlich
Project Technologist -- G. G. Burton

THE MANUFACTURER STATES THAT

The engineering staff of Parker McCrory Mfg. Co. with over 80 years total experience in manufacturing electric fence controllers, disagrees with the test procedures and results outlined in the report.

Industry tests have proven that actual fence conditions cannot be accurately simulated in a laboratory environment. Accurate testing of any electric fence controller must be performed on actual fence installations.

The proprietary design we use to simulate fence conditions consists of 29 custom fabricated capacitors and includes distributing inductive and resistive elements.

More than 3 million model A-DF electric fence controllers are in use worldwide for every conceivable type of fence installation, and provide complete customer satisfaction.

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

GENERAL DESCRIPTION

The Parmak A-DF electric fence controller is designed for 6 V battery operation and for outdoor use, without a weather-proof shelter.

The Parmak A-DF uses both electrical and mechanical components to produce the charge pulses. It has a two position shock intensity switch and two fence terminals to regulate the output of the controller. A light is provided to indicate operation of the controller.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The performance characteristics of the Parmak A-DF 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 Parmak A-DF is equipped with wire leads for connection to a 6 V battery. An internal battery may be used or a 6 V automotive battery can be substituted. The controller is designed for outdoor use without a 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.

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

Fence Condition: The manufacturer recommends that the Parmak A-DF be used only on insulated fences. The manufacturer states that for cattle fences, in areas with normal ground conditions, a single charged wire erected about two-thirds of animal height above ground 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 Parmak A-DF is equipped with a switch having two positions for shock intensity and a test position to check the fence condition with the indicator light.

The "MIZER" position is used to reduce battery consumption after the livestock have been trained. Two fence connection terminals are also provided. The "DRY" terminal is used for extremely dry or sandy soil and for training livestock.

When the test light flashes normally, it indicates that the fence is properly charged. If this light is very dim, 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 indicator light assembly was factory sealed. As a result, if the indicator light should need replacement, the controller would need factory servicing.

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 kΩ for an uninsulated, grass-grown, wet fence to well above 500 kΩ 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 kΩ for a cow standing in water and licking a charged wire to about 4 kΩ 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 Parmak A-DF 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 1240 V for a well-insulated, grass-free, dry fence to 90 V for an uninsulated, wet fence with considerable grass touching the charged wire. This occurred with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, output varied from 1390 V for a well-insulated, grass-free, dry fence to 70 V for an uninsulated, grass-grown, wet fence. For some normal fence conditions, output was above the 700 V minimum guard voltage needed for short-haired animals, while for all conditions, it was below the 2000 V minimum needed for long-haired animals. From FIGURE 1, it can be seen that the Parmak A-DF could be used to control short-haired animals if the fence is kept clean of plant growth during wet weather. A shorter fence would ensure more effective animal control.

On a 16 km (10 mi). fence (FIGURE 2), peak voltage output ranged from 760 V for a well-insulated, grass-free, dry fence to 100 V for an uninsulated, grass-grown, wet fence, with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, output varied from 1030 V for a well-insulated, grass-free, dry fence to 70 V for an uninsulated, grass-grown, wet fence. From FIGURE 2, it can be seen that the Parmak A-DF could not be satisfactorily used on this length of fence.

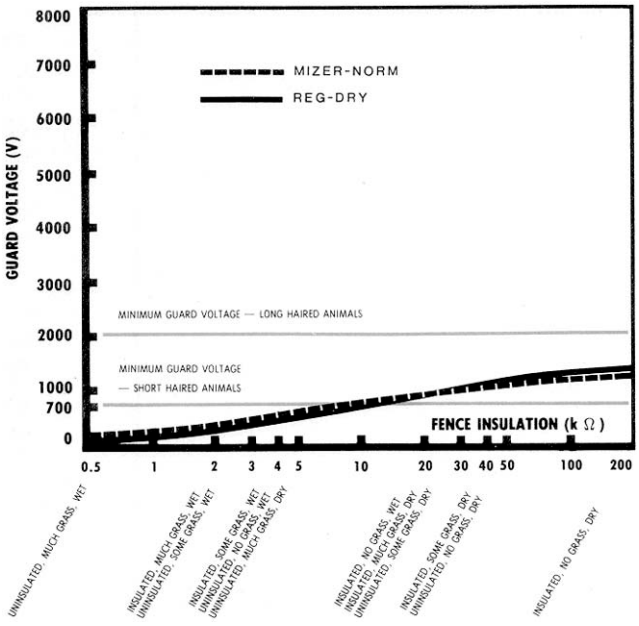

FIGURE 1. Guard Voltage Produced on a 5.4 km Single Wire Fence.

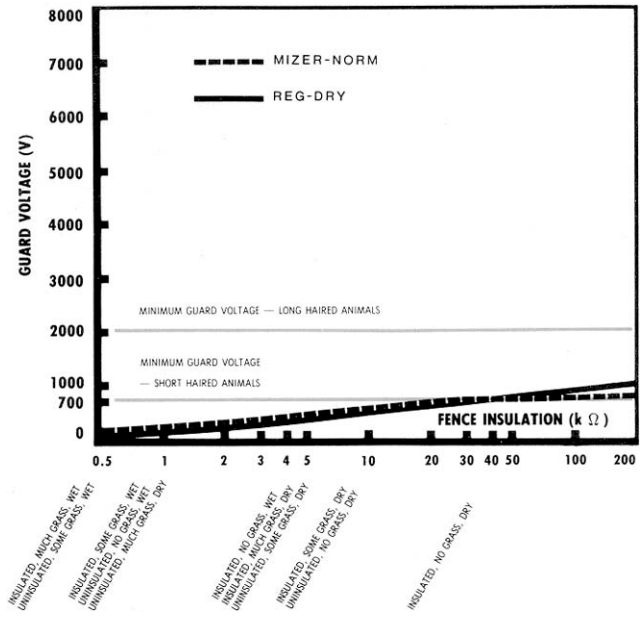

FIGURE 2. Guard Voltage Produced on a 16 km Single Wire Fence.

Electrical Charge: FIGURES 3 to 6 show the current output of the Parmak A-DF when a cow touches 5.4 and 16 km (3.3 and 10 mi) lengths of well-insulated, single wire fence, with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. FIGURES 3 and 4 are for an animal resistance of 0.5 kΩ, 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 kΩ, 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.

The peak current delivered by the Parmak A-DF varied from 0.17 A for a well-grounded cow touching the 5.4 km (3.3 mi) fence to 0.11 A for a normally-grounded cow touching the 16 km (10 mi) fence. This occurred with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch set in the "REG" position and the fence connected to the "DRY" terminal, peak current output was about 20% less. The peak current output indicated that the Parmak A-DF gave a minimal shock on well-insulated fences longer than 5.4 km (3.3 mi).

The number of charge pulses delivered per minute varied from 51 to 62. The on-time was also affected by fencer load and varied from about 3 to 64 ms.

Low Temperature Operation: The Parmak A-DF could 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 1350 V, 8% higher than its output at room temperature. This occurred with the voltage switch set in the "MIZER" position and the fence connected to the "NORMAL" terminal. With the voltage switch .set in the "REG" position and the fence connected to the "DRY" terminal, peak voltage output was about 1560 V, 11% higher than its output at room temperature. A higher peak voltage output could be expected on a shorter feeding fence. The peak voltage output was well above the 700 V minimum required for short-haired animals, but was below the 2000 V minimum required for long-haired animals.

Since battery voltage is severely reduced at low temperatures, it may be necessary to provide a heated battery enclosure to ensure effective winter operation. 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.

Battery Consumption: A 6 V, 70 amp-hour automotive battery will operate the Parmak A-DF from eight to fifteen weeks, depending upon the naturally occurring discharge rate. The consumption rate increased considerably as the load on the controller increased. The battery should be regularly checked to ensure effective controller performance.

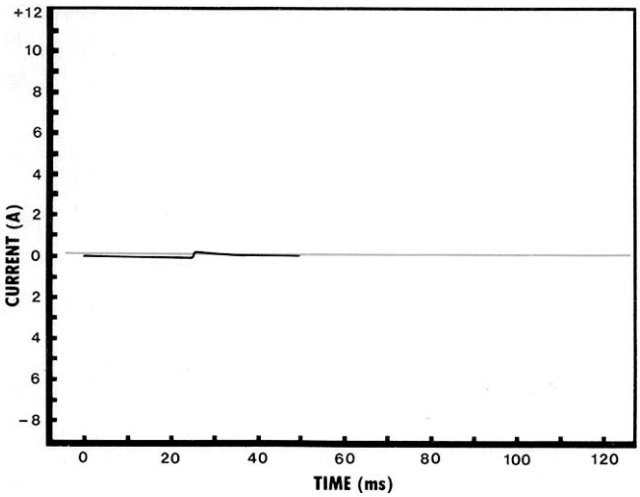

FIGURE 3. Current Delivered to a Well-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

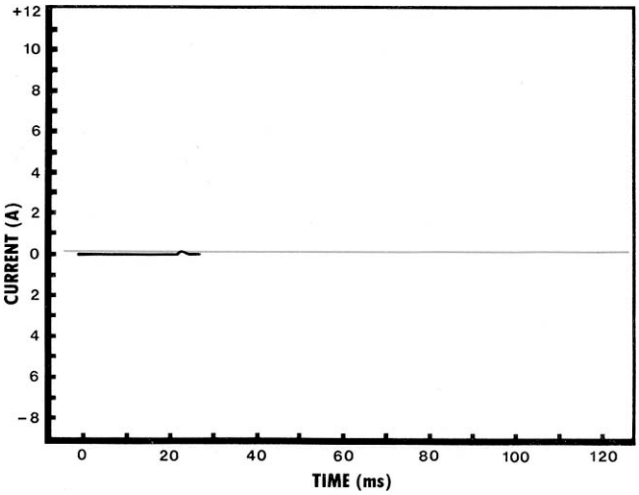

FIGURE 5. Current Delivered to a Normally-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

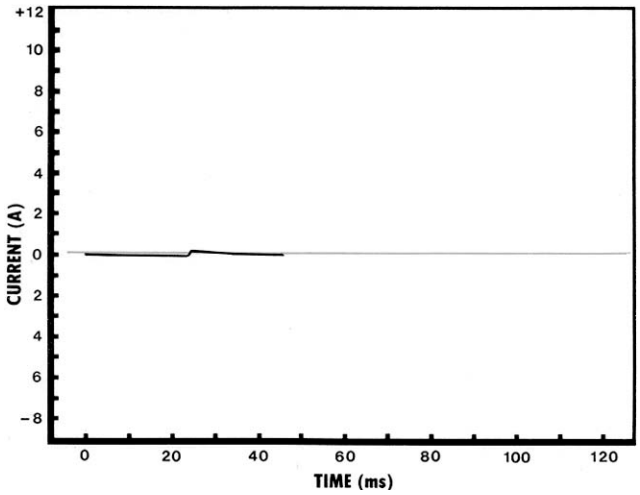

FIGURE 4. Current Delivered to a Well-Grounded Cow Touching a 16 km Well-Insulated Fence.

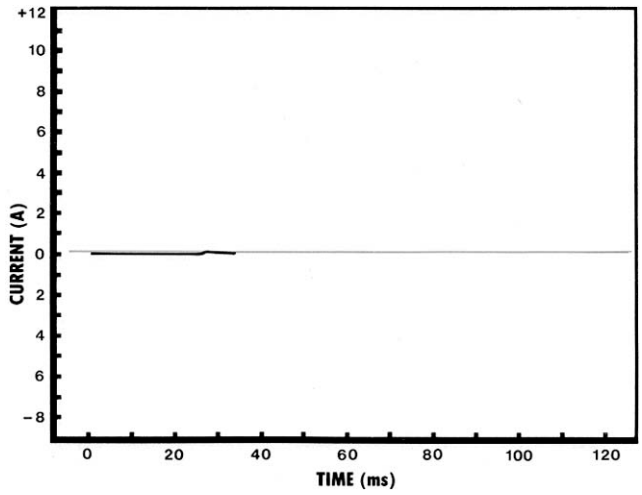

FIGURE 6. Current Delivered to a Normally-Grounded Cow Touching a 16 km Well-Insulated Fence.

SAFETY

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

INSTRUCTION MANUAL

The instruction manual outlined installation, safety considerations and operation, and discussed types of fences suitable for various conditions.

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:	Parmak Electric Fence Controller
MODEL:	A-DF
SERIAL NUMBER:	2465863
TYPE:	Electro-Mechanical
POWER REQUIREMENTS:	6 V DC
WEIGHT:	4.5 kg
OVERALL DIMENSIONS:	
-- length	175 mm
-- width	215 mm
-- height	302 mm
NUMBER OF INDICATOR LIGHTS:	1 (shock intensity)
TYPE OF ENCLOSURE:	for outdoor 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)

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