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Evaluation Report 264

Gallagher Bev II Electric Fence Controller

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

GALLAGHER BEV II ELECTRIC FENCE CONTROLLER

MANUFACTURER:

Gallagher Electronics Ltd.
Hamilton, New Zealand

RETAIL PRICE:

$330.00 (December, 1981, f.o.b. Humboldt)

RETAIL OUTLET:

Lamb Acres Farm Supply
P.O. Box 104
Bulyea, Saskatchewan
S0G 0L0

SUMMARY AND CONCLUSIONS

The Gallagher BEV II electric fence controller was very suitable for use over a wide range of fence conditions. Wire insulators were unnecessary for most fences while plant growth did not appreciably affect controller performance in most conditions.

Peak voltage output on a 5.4 km (3.3 mi) single wire fence varied from 7510 V for a well-insulated, grass-free, dry fence to 5320 V for an uninsulated, grass-grown, wet fence, with the fence connected to the RED output terminal. The YELLOW output terminal produced peak voltage output of 3240 V for a well-insulated, grass-free, dry fence to 1250 V for an uninsulated, grass-grown, wet fence. The output was above the 2000 V minimum guard voltage required for long-haired animals for most fence conditions.

Peak voltage output on a 16 km (10 mi) single wire fence varied from 6720 V for a well-insulated, grass-free, dry fence to 5100 V for an uninsulated, grass-grown, wet fence, with the fence connected to the RED output terminal. The YELLOW output terminal produced peak voltage output of 2190 V for a well-insulated, grass-free, dry fence to 1080 V for an uninsulated, grass-grown, wet fence.

With the fence connected to the RED terminal, peak current flow through a cow touching a well-insulated 5.4 and 16 km (3.3 and 10 mi) single wire fence varied from 10.0 to 9.7 A for a cow standing in water and 2.2 to 2.1 A for a normally-grounded cow. The peak current delivered from the RED output terminal was about 4 times greater than that from the YELLOW output terminal. The high peak current output indicated that the Gallagher BEV II generated quite an intense shock on fairly long or poorly insulated fences.

The Gallagher BEV II was 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 when operating from the RED terminal, was about 7800 V, 4% higher than its output at room temperature. Peak voltage output was about 3000 V, only 7% lower than its output at room temperature, when operating from the YELLOW terminal.

The BEV II had CSA approval for indoor use.

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

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

GENERAL DESCRIPTION

The Gallagher BEV II Electric fence controller is designed for 115 V AC operation. It is meant to be mounted in a suitable weather-proof enclosure.

The Gallagher BEV II contains solid-state electronics, with no moving parts. It may be used on fences without insulators. It has two fence terminals to regulate the output of the controller. A light is provided to indicate operation.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The performance characteristics of the Gallagher BEV II 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 Gallagher BEV II is equipped with a three wire cord and plug for connection to a standard, grounded, 115 V AC receptacle. The controller is CSA approved for indoor use 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: The manufacturer states that the Gallagher BEV II should be used on fences with wire insulators. 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.

The manufacturer recommends that for cattle fences, 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 Gallagher BEV II is equipped with two fence terminals. The RED output terminal is used for normal fence conditions and the YELLOW output terminal is usually used for short fences around farm sites. The controller is also equipped with a flashing light that indicates if 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.

Consistent with safety practice for power line-operated fencers, the controller was factory sealed. However, the controller could be dealer serviced.

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

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 Gallagher BEV II for 5.4 and 16 km (3.3 and 10 mi) lengths of single wire fence over a range of insulation resistances. With the fence connected to the RED output terminal, peak voltage output on a 5.4 km (3.3 mi) fence (FIGURE 1) varied from 7510 V for a well-insulated, grass-free, dry fence to 5320 V for an uninsulated, wet fence with considerable grass touching the charged wire. With the fence connected to the YELLOW output terminal, peak voltage output varied from 3240 V for a well-insulated, grass-free, dry fence to 1250 V for an uninsulated, wet fence with considerable grass touching the charged wire. The voltage output for most fence conditions, was above the 2000 V minimum guard voltage needed for long-haired animals. From FIGURE 1, it can be seen that the Gallagher BEV II 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 6720 V for a well-insulated, grass-free, dry fence to 5100 V for an uninsulated, grass-grown, wet fence, with the fence connected to the RED output terminal. With the fence connected to the YELLOW output terminal, peak voltage output varied from 2190 V for a well-insulated, grass-free, dry fence to 1080 V for an uninsulated, grass-grown, wet fence. Voltage output was above the 2000 V minimum required for long-haired animals for most fence conditions, and was above the 700 V minimum guard voltage required for short-haired animals for all fence conditions.

As can be seen from both FIGURES 1 and 2, plant growth touching a fence did not appreciably affect controller performance, since the voltage output was above 2000 V for nearly all fence conditions. The Gallagher BEV II can be expected to operate very well over a wide range of fence conditions.

Electrical Charge: FIGURES 3 to 6 show the current output of the Gallagher BEV II from the RED output terminal 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 animal resistances 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.

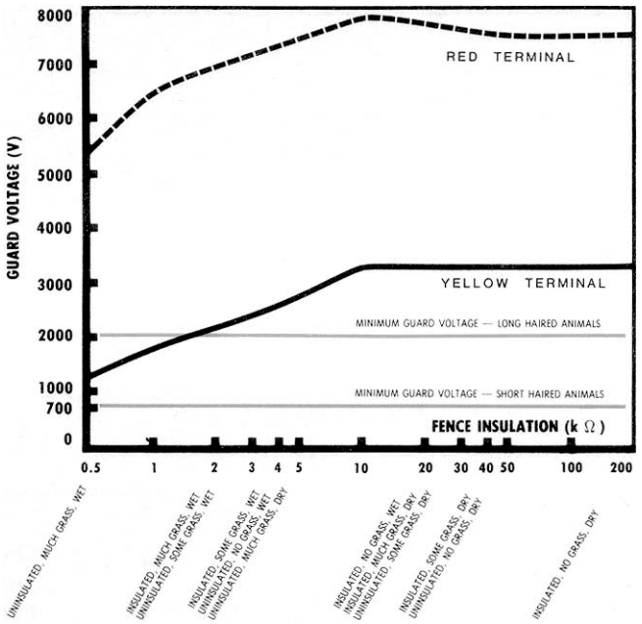

FIGURE 1. Guard Voltage Produced on a 5.4 km Single Wire Fence.

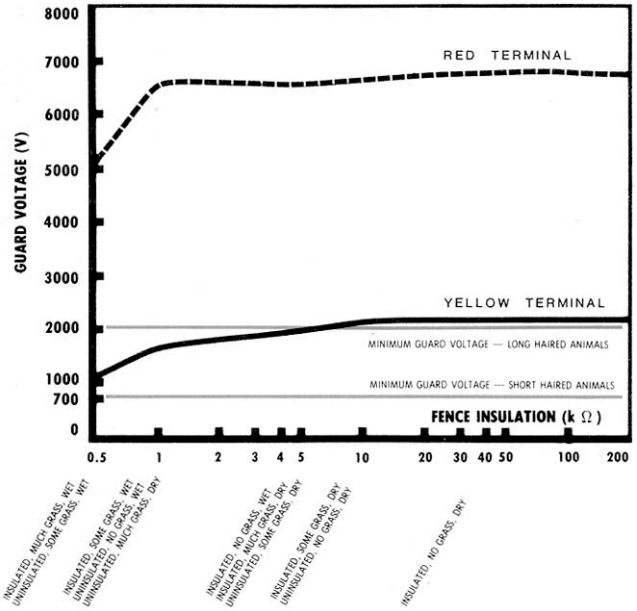

FIGURE 2. Guard Voltage Produced on a 16 km Single Wire Fence.

The peak current delivered by the Gallagher BEV II with the fence connected to the RED output terminal, varied from 10.0 A for a well-grounded cow touching the 5.4 km (3.3 mi) fence to 2.1 A for a normally-grounded cow touching the 16 km (10 mi) fence.

The peak current delivered from the RED output terminal was about 4 times greater than that from the YELLOW output terminal. The Gallagher BEV II gave quite an intense shock and was suitable for fairly long or poorly insulated fences.

About 56 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 0.21 to 6.0 ms.

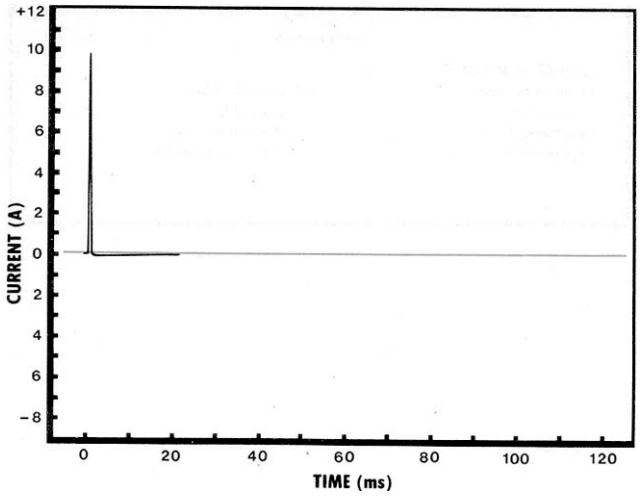

FIGURE 3. Current Delivered to a Well-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

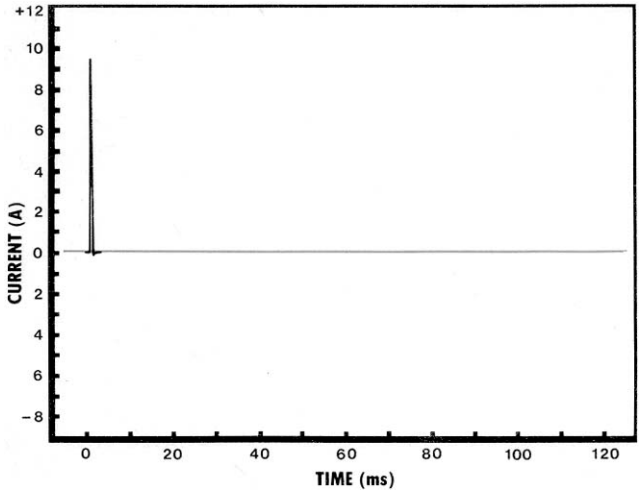

FIGURE 4. Current Delivered to a Well-Grounded Cow Touching a 16 km Well-Insulated Fence.

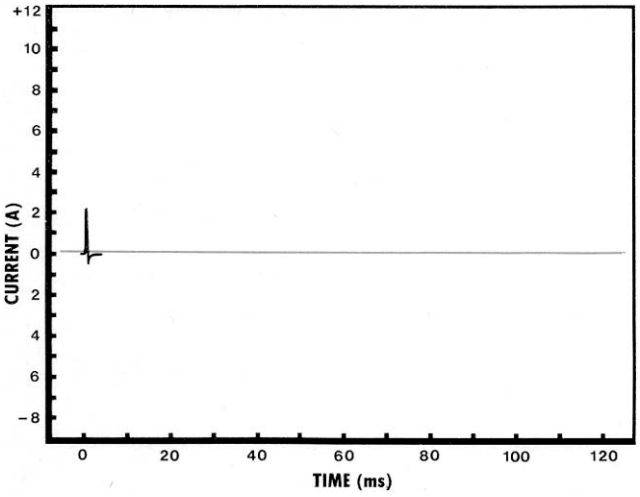

FIGURE 5. Current Delivered to a Normally-Grounded Cow Touching a 5.4 km Well-Insulated Fence,

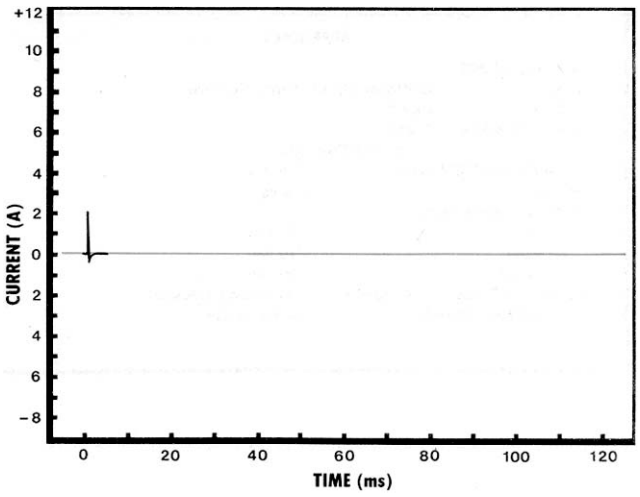

FIGURE 6. Current Delivered to a Normally-Grounded Cow Touching a 16 km Well-Insulated Fence.

Low Temperature Operation: The Gallagher BEV II 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 with the fence connected to the RED output terminal was about 7800 V, 4% higher than its output at room temperature. With the fence connected to the YELLOW output terminal, peak voltage output was about 3000 V, only 4% lower than its output at room temperature. Since the peak voltage output was above the 2000 V minimum required to overcome the insulation resistance of long-haired animals, the Gallagher BEV II 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

The Gallagher BEV II had CSA approval for indoor use.

The instruction manual clearly outlined safety considerations. No safety problems were evident if the manufacturer's instructions were followed.

INSTRUCTION MANUAL

The instruction manual was clear, concise and well illustrated. It outlined installation, safety considerations and operation, as well as suitable fence configurations.

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:	Gallagher Electric Fence Controller
MODEL:	BEV II
SERIAL NUMBER:	83869
TYPE:	Solid State Electronic
POWER REQUIREMENTS:	115 V AC
WEIGHT:	4.8 kg
OVERALL DIMENSIONS:	
-- length	120 mm
-- width	210 mm
-- height	325 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)

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