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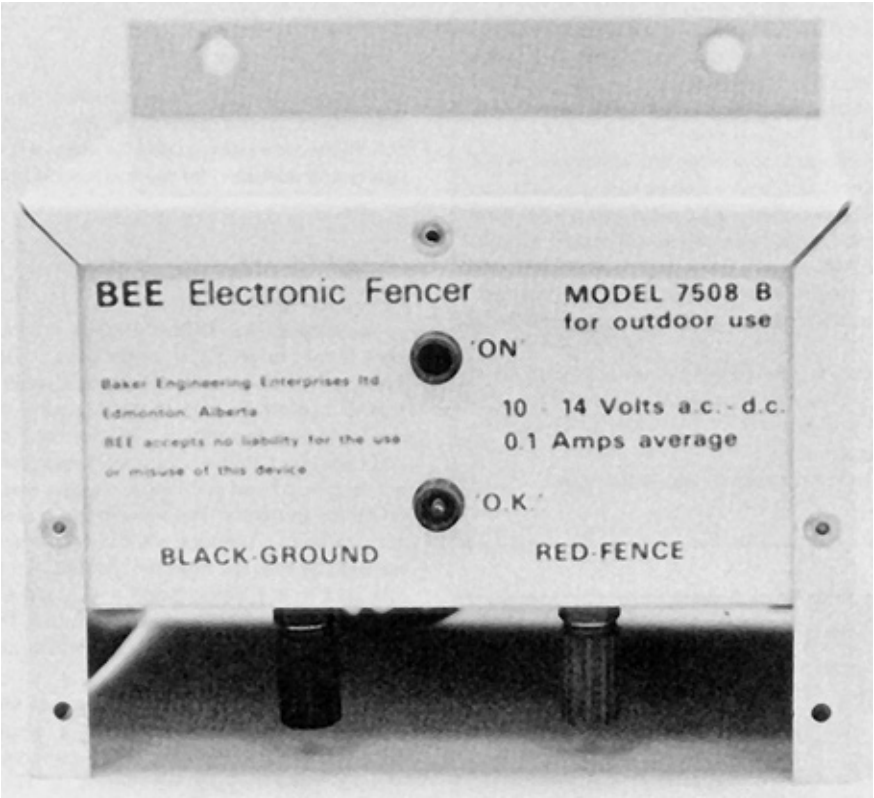
Evaluation Report 105



Bee 7508B Fence Controller

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

BEE 7508B FENCE CONTROLLER

MANUFACTURER:

Baker Engineering Enterprises Ltd.
9620-27th Avenue
Edmonton, Alberta

DISTRIBUTOR:

Alberta: Mitchell Agra Industries
Westlock, Alberta
T0G 2L0

Saskatchewan: St. Walburg Produce
St. Walburg, Saskatchewan
S0M 2T0

RETAIL PRICE:

$89.00 (August, 1979, f.o.b. Humboldt)

SUMMARY AND CONCLUSIONS

The BEE 7508B 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 2300 V for a well-insulated, grass-free, dry fence to 1550 V for an uninsulated, grass-grown, wet fence. For most normal fence conditions, output was above the 2000 V minimum guard voltage recommended for long-haired animals, while for extreme conditions it was above the 700 V minimum needed for short-haired animals. For most fence conditions, the BEE 7508B could be used without wire insulators on this fence length.

Peak voltage output on a 16 km (10 mi) single wire fence varied from 1350 V for a well-insulated, grass-free, dry fence to 1025 V for an uninsulated, grass-grown, wet fence. Plant growth touching an uninsulated, dry fence did not appreciably reduce voltage output.

Peak current flow through a cow touching well-insulated 5.4 and 16 km (3.3 and 10 mi) single wire fences varied from 3.1 to 2.1 A for a cow standing in water and from 0.54 to 0.32 A for a normally-grounded cow. The high peak current output indicated that the BEE 7508B generated quite an intense shock and was suitable for fairly long fences or poorly insulated fences.

Total charge delivered by the Bee 7508B varied from 0.05 to 0.36 mC.

The BEE 7508B was suitable for cold weather use on short feeding fences. Peak voltage output at -37°C on a 5.4 km (3.3 mi) single wire fence was about 1175 V, 49% lower than its output at room temperature.

No durability problems occurred during testing.

RECOMMENDATIONS

It is recommended that the manufactorer consider:

1. Modifications to permit field replacement of indicator light bulbs.

Chief Engineer -- E. O. Nyborg
Senior Engineer -- L. G. Smith
Technical Officer -- J. M. Williams

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Indicator light bulbs are of the non-filament neon discharge type and are not likely to require replacement unless there is a major fault in the controller which would require factory service to ensure electrical safety. Field replacement of indicator light bulbs is not presently being considered.

ADDITIONAL COMMENTS

The manufacture of the BEE 7508B has been discontinued in favor of the BEE model 7722 which has improvement in efficiency of conversion of battery energy to fence charge and improvement in output voltage especially in cold weather. The retail price of the model 7722 is $95.00 (August, 1979, f.o.b. Humboldt).

GENERAL DESCRIPTION

The BEE 7508B fence controller is designed for 12 V battery operation and for outdoor use, without a weather shelter.

The BEE 7508B contains solid-state electronics, with no moving parts. It may be used on fences without insulators. Lights are provided to indicate operation and shock intensity.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The performance characteristics of the BEE 7508B 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 BEE 7508B is equipped with wire leads for connection to a 12 V automotive battery. The controller is designed for outdoor use, without a weather 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 2 to 3 m ground rod length may be needed.

Fence Conditlon: The manufacturer states that the BEE 7508B may be used on fences without wire insulators. The wire can be stapled directly to wooden posts, but should not be directly attached to live trees, green posts, salt-treated wooden posts or steel posts. 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 fence 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 BEE 7508B is equipped with two indicator lights. One light indicates that the controller is operating while a second light indicates that a charge is being supplied to the fence. When this light flashes normally, it indicates that the fence is properly charged. Conversely, if this light is not flashing, it indicates that insufficient charge is being placed on the fence, which may be the result of too long a fence or poor insulation. A portable fence tester is supplied with the BEE 7508B, to use in locating short circuits in fences.

The controller was sealed from the factory and indicator lights could not be replaced without factory servicing. It is recommended that the manufacturer consider modifications to permit indicator light bulb replacement without chassis disassembly.

**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. For safety reasons, the total electrical charge in each pulse of power line-operated controllers should not exceed 1 mC if it has an on-time less than 14.2 ms. For an on-time of 200 ms, 4 mC is the allowable total electrical charge. Electrical regulations do not apply to battery-operated controllers.

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 alectrical 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 single wire fence typically varies 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 certain 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 BEE 7508B for 5.4 and 16 km lengths of single wire fence over a range of insulation resistances. On a 5.4 km fence (FIGURE 1), peak voltage output varied from 2300 V for a well-insulated, grass-free, dry fence to 1550 V for an uninsulated, wet fence with considerable grass touching the charged wire. The voltage output was 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 1.4 kΩ. From FIGURE 1, it can be seen that the BEE 7508B can be satisfactorily used on this length of fence, without wire insulators, in most conditions.

On a 16 km fence (FIGURE 2), peak voltage output ranged from 1350 V for a well-insulated, grass-free, dry fence to 1025 V for an uninsulated, grass-grown, wet fence. Voltage output was below the 2000 V minimum required for long-haired animals, but was above the 700 V minimum required for short-haired animals, for all fence conditions.

As can be seen from both FIGURES 1 and 2, plant growth touching an uninsulated, dry fence did not appreciably reduce the voltage output. The BEE 7508B 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 BEE 7508B when a cow touches 5.4 and 16 km lengths of well-insulated, single wire, fence. 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

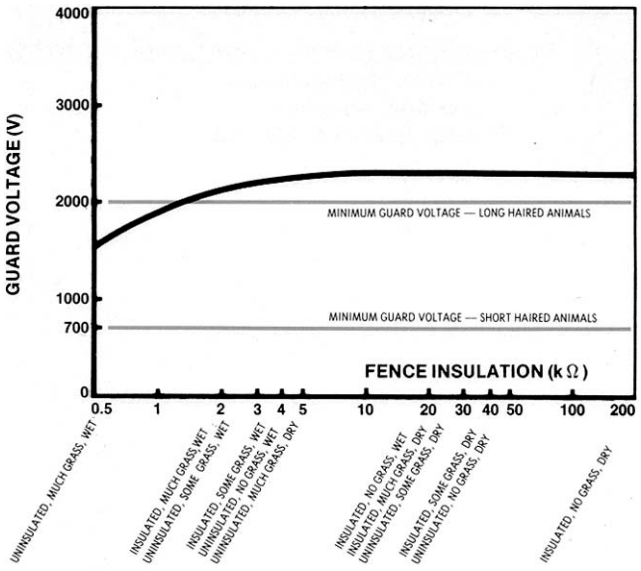


FIGURE 1. Guard Voltage Produced on a 5.4 km Single Wire Fence.

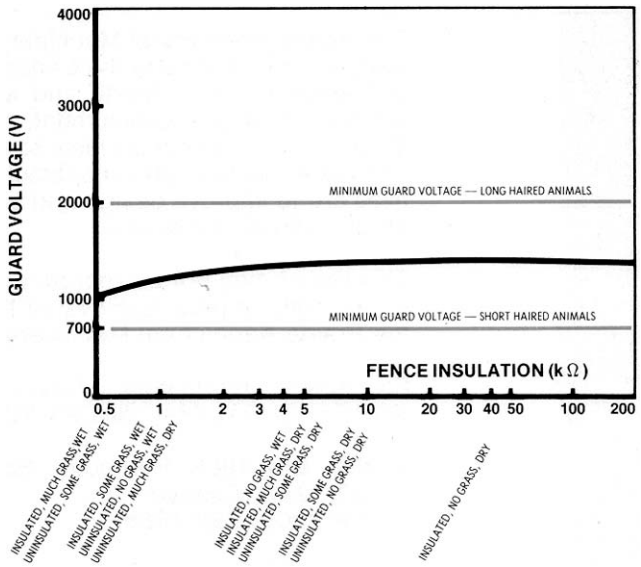


FIGURE 2. Guard Voltage Produced on a 16 km Single Wire Fence.

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 BEE 7508B varied from 3.1 A for a well-grounded cow touching the 5.4 km fence to 0.32 A for a normally-grounded cow touching the 16 km fence. The total charge delivered to the cow varied from 0.05 to 0.36 mC. The BEE 7508B gave quite an intense shock and was suitable for fairly long fence lengths or poorly insulated fences.

About 26 charge pulses per minute were delivered. The number of pulses did not vary with fencer load, however, the on-time was affected by the load. On-time varied from about 1.7 to 2.6 ms.

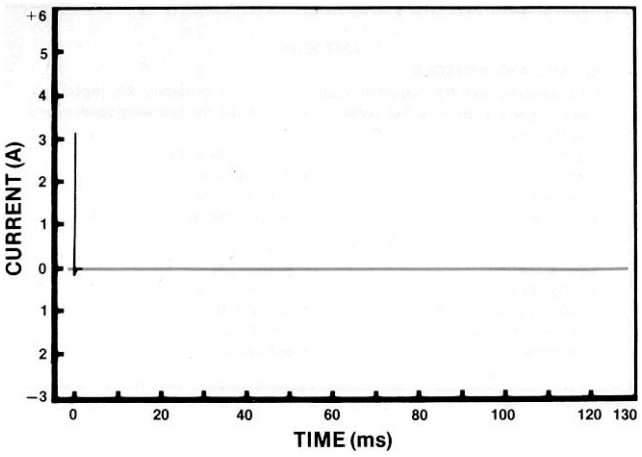


FIGURE 3. Current Delivered to a Well-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

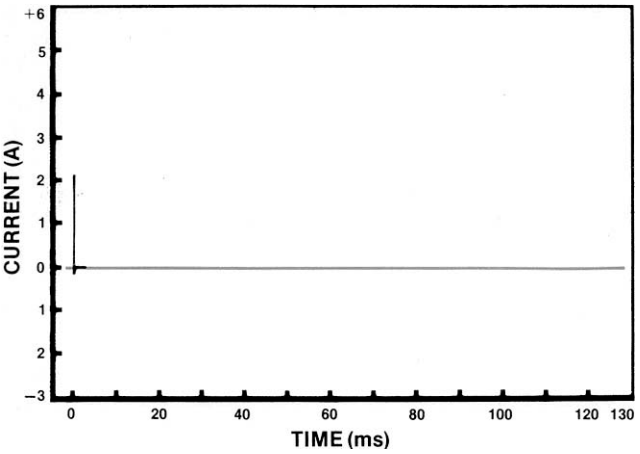


FIGURE 4. Current Delivered to a Well-Grounded Cow Touching a 16 km Well-Insulated Fence.

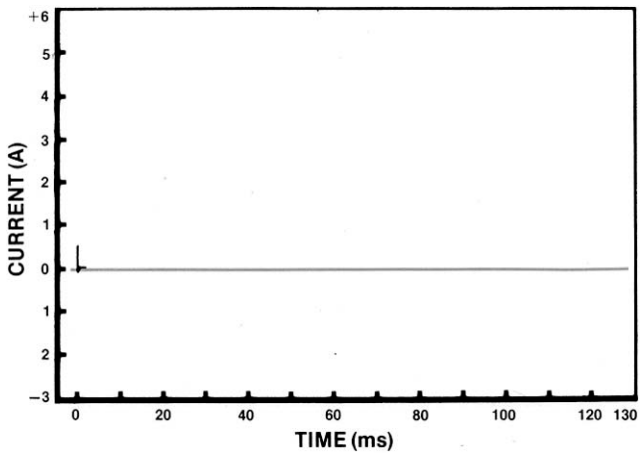


FIGURE 5. Current Delivered to a Normally-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

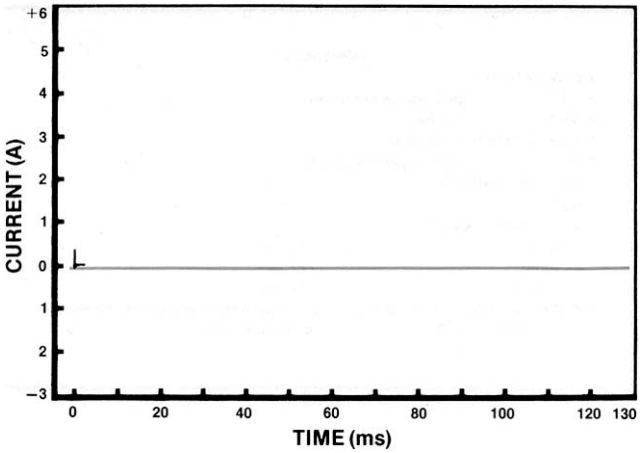


FIGURE 6. Current Delivered to a Normally-Grounded Cow Touching a 16 km Well-Insulated Fence.

Low Temperature Operation: The BEE 7508B could be used to energize cattle feeding wires during low winter temperatures. The peak voltage output of the controller at -37°C on a 5.4 km single wire fence was about 1175 V, 49% lower than its output at room temperature. A higher peak voltage could be expected on a short feeding fence. The peak voltage output was well above the 700 V minimum required to overcome the insulation resistance of 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 is 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 12 V, 70 amp-hour battery will operate the BEE 7508B about four weeks before recharging is required. The consumption rate did not increase as the load on the controller increased. The battery should be regularly checked to ensure effective controller performance.

SAFETY

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 discussing 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:	BEE Fence controller
MODEL:	7508B
SERIAL NUMBER:	2339 EFB
TYPE:	Solid State Electronic
POWER REQUIREMENTS:	12 V DC
WEIGHT:	1.0 kg
OVERALL DIMENSIONS:	
-- length	142 mm
-- width	127 mm
-- height	122 mm
NUMBER OF INDICATOR LIGHTS:	2 (for operation and shock intensity)
TYPE OF ENCLOSURE:	for outdoor use

APPENDIX II

SI UNITS AND SYMBOLS

(a) In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used:

1 millimetre (mm)	= 0.039 inches (in)
1 metre (m)	= 3.28 feet (ft)
1 kilometre (km)	= 0.62 mile (mi)
1 kilogram (kg)	= 2.2 pounds (lb)

(b) The following symbols are used in this report:

electric current	= ampere (A)
electric potential	= volt (V)
electric charge	= coulomb (C)
electric resistance	= ohm (Ω)
pulse time	= second (s)

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