

# Evaluation Report

# 256



## Gallagher E12 Electric Fence Controller

A Co-operative Program Between



# GALLAGHER E12 ELECTRIC FENCE CONTROLLER

## MANUFACTURER:

Gallagher Electronics Ltd.  
Hamilton, New Zealand

## RETAIL OUTLET:

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

## RETAIL PRICE:

\$170.00 (December, 1981, f.o.b. Humboldt)

## SUMMARY AND CONCLUSIONS

The Gallagher E12 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 5210 V for a well-insulated, grass-free, dry fence to 3690 V for an uninsulated, grass-grown, wet fence. Output was well above the 2000 V minimum guard voltage recommended for long-haired animals.

Peak voltage output on a 16 km (10 mi) single wire fence varied from 2960 V for a well-insulated, grass-free, dry fence to 2420 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 7.7 to 4.8 A for a cow standing in water and 1.52 to 0.79 A for a normally-grounded cow. The high peak current output indicated that the Gallagher E12 generated quite an intense shock on fairly long or poorly insulated fences.

The Gallagher E12 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 5240 V, 1% higher than its output at room temperature.

No durability problems occurred during testing.

## RECOMMENDATIONS

A need for recommendations was not apparent.

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

## GENERAL DESCRIPTION

The Gallagher E12 electric fence controller is designed for 12 V battery operation. It may be mounted outdoors without a weather-proof shelter.

The Gallagher E12 contains solid-state electronics, with no moving parts. It may be used on fences without insulators. A light is provided to indicate operation. A three position switch is used to control the pulse frequency.

Detailed specifications are given in APPENDIX I.

## SCOPE OF TEST

The performance characteristics of the Gallagher E12 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 E12 is equipped with wire leads for connection to a 12 V automotive battery. The controller is designed for outdoor use, without a weather-proof shelter.

The controller is connected to the fence directly or 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 recommends that the Gallagher E12 be used on fences with wire insulators. If the fence is in good repair, the controller will 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 E12 is equipped with a flashing light 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 indicator light could be dealer serviced.

The pulse frequency switch is used in setting #3 to train livestock and in setting #2 or #1 to conserve the battery after the livestock have been trained.

### 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 fence 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 E12 for a 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 5210 V for a well-insulated, grass-free, dry fence to 3690 V for an uninsulated, wet fence with considerable grass touching the charged wire. The voltage output for all fence conditions, was well above the 2000 V minimum guard voltage needed for long-haired animals. From FIGURE 1, it can be seen that the Gallagher E12 can be satisfactorily used on this length of fence without wire insulators.

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

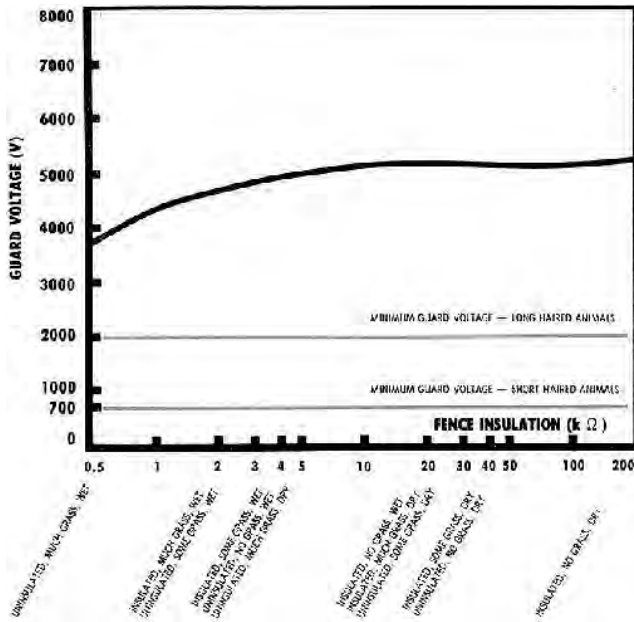


FIGURE 1. Guard Voltage Produced on a 5.4 km Single Wire Fence.

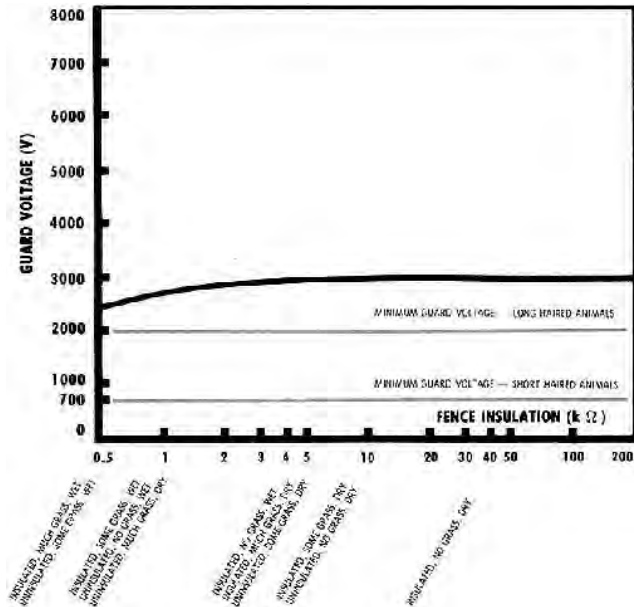


FIGURE 2. Guard Voltage Produced on a 16 km Single Wire Fence.

On a 16 km (10 mi) fence (FIGURE 2), peak voltage output ranged from 2960 V for a well-insulated, grass-free, dry fence to 2420 V for an uninsulated, grass-grown, wet fence. Voltage output was above the 2000 V minimum required for long-haired animals for fence conditions. Wire insulators also were unnecessary for this length of fence.

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 all fence conditions. The Gallagher E12 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 Gallagher E12 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 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 Gallagher E12 varied from 7.7 A for a well-grounded cow touching the 5.4 km (3.3 mi) fence to 0.79 A for a normally-grounded cow touching the 16 km (10 mi)

fence. The Gallagher E12 gave quite an intense shock on fairly long or poorly insulated fences.

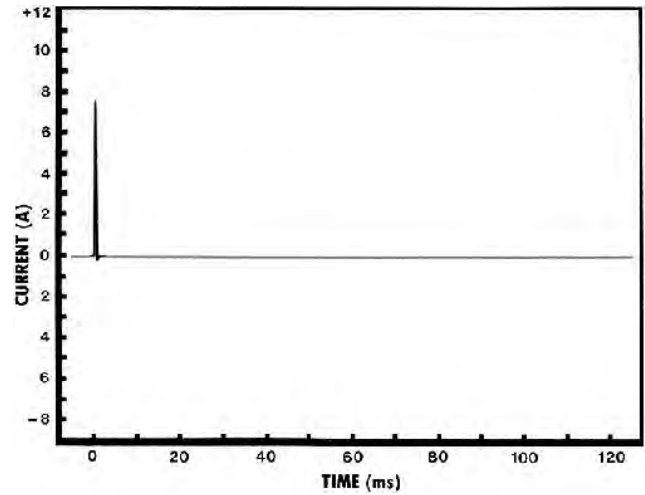


FIGURE 3. Current Delivered to a Well-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

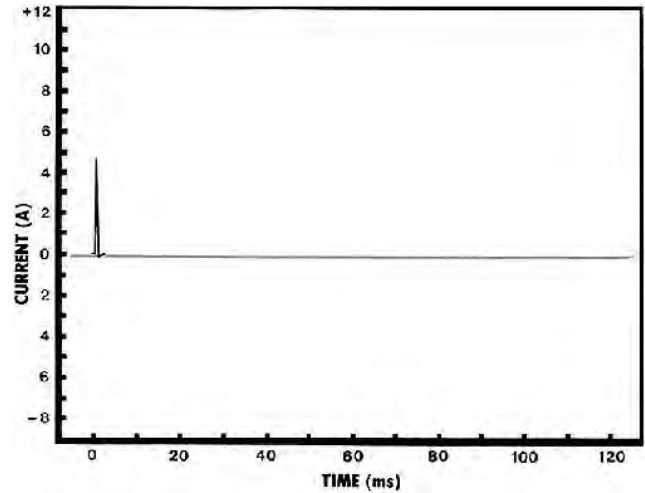


FIGURE 4. Current Delivered to a Well-Grounded Cow Touching a 16 km Well-Insulated Fence.

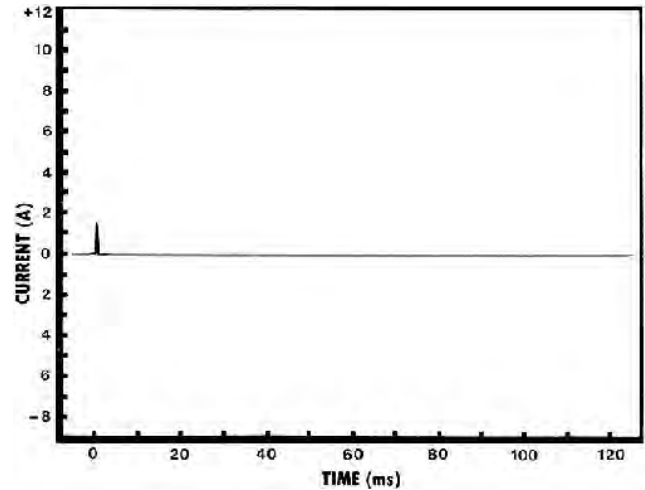


FIGURE 5. Current Delivered to a Normally-Grounded Cow Touching a 5.4 km Well-Insulated Fence.

A switch was provided to vary the number of pulses that were delivered. About 21 charge pulses per minute were delivered for setting #1, 34 for setting #2 and 54 for setting #3. The number of pulses did not vary with fence load; however, the on-time was affected by load. On-time varied from about 0.19 to 1.58 ms.

**Low Temperature Operation:** The Gallagher E12 could effectively be used to energize cattle feeding wires during low winter

temperatures. The peak voltage output of the controller at  $-35^{\circ}\text{C}$  on a 5.4 km (3.3 mi) single wire fence was about 5240 V, 1% higher 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 Gallagher E12 was very suitable for feeding enclosures.

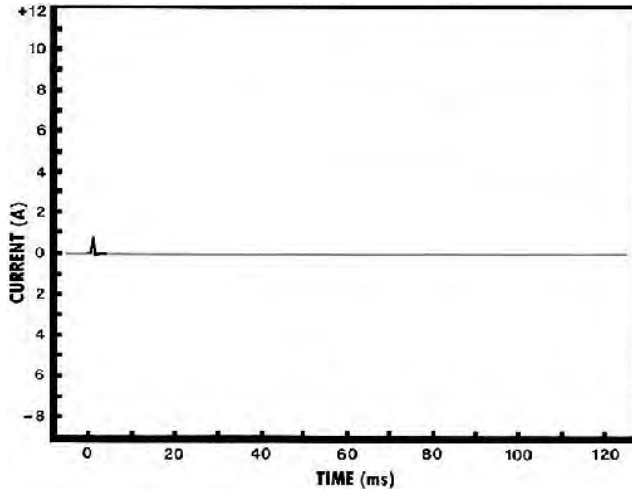


FIGURE 6. Current Delivered to a Normally-Grounded Cow Touching a 16 km Well-Insulated Fence.

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 12 V, 70 amp-hour battery will operate the Gallagher E12 from four to nine weeks, depending upon the naturally occurring discharge rate. The consumption rate did not increase as the load on the controller increased, but did increase as the shock frequency was increased. The battery should be regularly checked to ensure effective controller performance.

#### SAFETY

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

<b>MAKE:</b>	Gallagher Electric Fence Controller
<b>MODEL:</b>	E12
<b>SERIAL NUMBER:</b>	17033
<b>TYPE:</b>	Solid State Electronic
<b>POWER REQUIREMENTS:</b>	12 V DC
<b>WEIGHT:</b>	1.9 kg
<b>OVERALL DIMENSIONS:</b>	
-- length	92 mm
-- width	158 mm
-- height	255 mm
<b>NUMBER OF INDICATOR LIGHTS:</b>	1 (operation indicator)
<b>TYPE OF ENCLOSURE:</b>	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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