Gallagher

F31/F32 Fence Controller

Installation Note

Gallagher F31 Fence Controller: G21920 / G21921 / G21922
Gallagher F32 Fence Controller: G21940 / G21941 / G21942



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ATTENTION: This equipment contains components that can be damaged by electrostatic discharge. Ensure both you and the equipment are earthed before beginning any servicing.

1 Introduction

The Gallagher F31/F32 Fence Controller is a high voltage perimeter security fence energizer.

Regulated electrical pulses are sent along each Fence Channel. Each pulse will deliver a short, but safe shock. The end of the Fence Channel is connected back to the Fence Controller where it measures the returning pulse. Any attempt to tamper with the fence results in the appropriate alarm being generated.

The Fence Controller can operate in Stand Alone mode (configuration is controlled via the SW1 dipswitches), or in HBUS mode (configuration is received from Gallagher Command Centre).
Note: When in Stand Alone mode the Comms LED will be off at all times.

The battery test threshold used in Stand Alone mode can by changed from the default 11.5V by turning dipswitch 1 off, connecting to Command Centre via a Controller 6000 using HBUS, changing the "Test Level" setting on the Alerts tab, then disconnecting and turning dipswitch 1 back on again.

The differences between the two Fence Controllers are shown below.

Fence Controller	Fence Channels	Inputs	Outputs	HV Sync	LV Sync
F31 Fence Controller	1	2	4	No	Yes
F32 Fence Controller	2	3	5	Yes	Yes

Inputs and outputs on the Fence Controller can be used with an external alarm system, siren, flood lighting, gate switch, or other devices of this nature.

1.1 To get the best from your Fence Controller

To gain maximum performance from your Fence Controller it is recommended you use Gallagher accessories. Using Gallagher accessories will help you achieve a very reliable, high performance security system.

1.2 Carton Contents

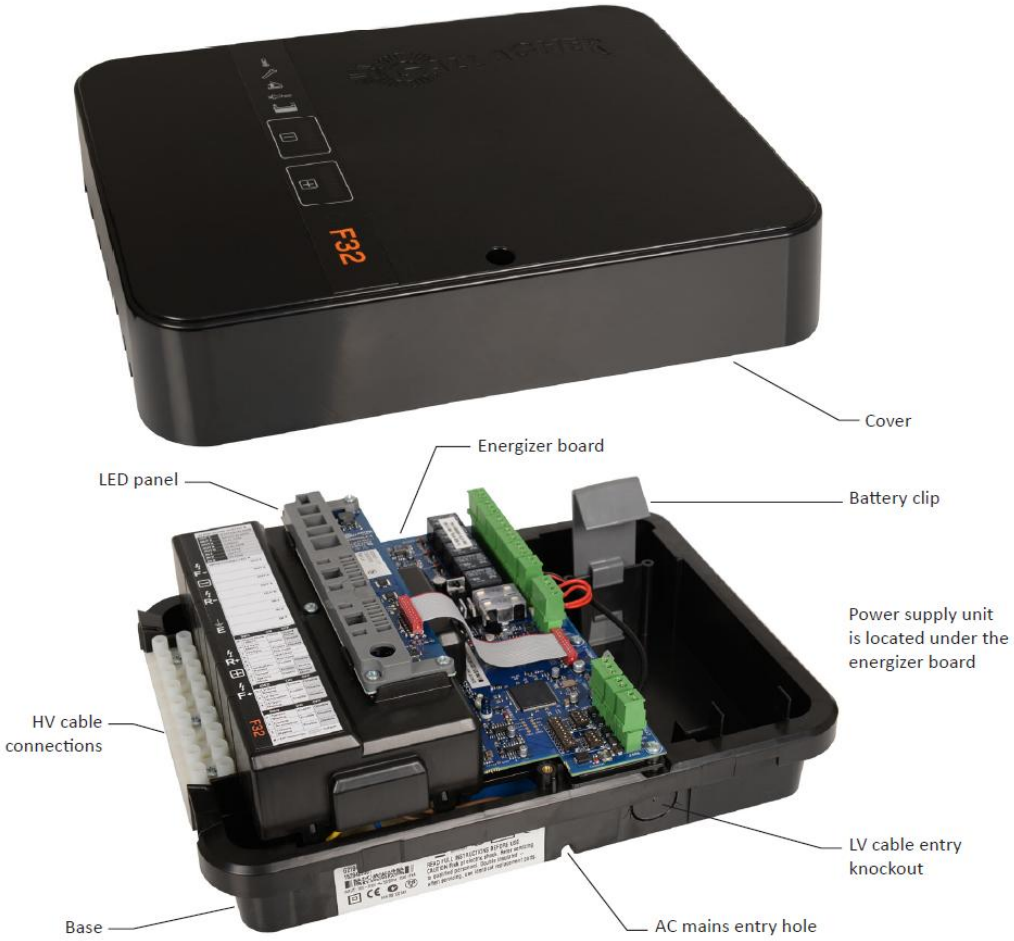
Check the carton contains the following items:

- 1 x Fence Controller cover
- 1 x Fence Controller base assembly with fitted power supply unit (G21961)
- 1 x Bag of small components (4 wall plugs, 4 base screws, 1 battery lead, and 1 magnetic key)
- 1 x Gallagher F31/F32 Fence Controller installation note (3E3789)

The battery and power cord are not included in the carton, these items are supplied by your approved Gallagher distributor.

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1.3 Fence Controller components



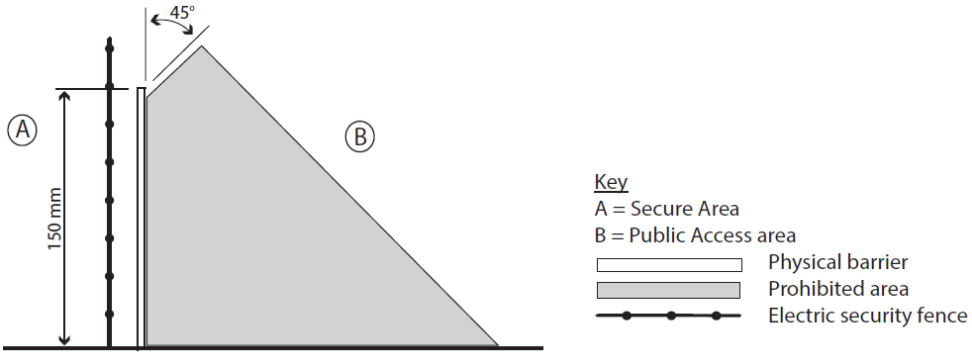
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2 Important information

WARNING: Read all instructions

- The Electric Security Fence must be applied in a manner to minimise potential injury of persons and loss or damage to property. It shall be designed, installed, operated and maintained so that, under normal conditions of operation, the public is separated from inadvertent contact with pulsed conductors and the structure is not a mantrap.
- The Electric Security Fence shall be protected from public access by means of a physical barrier. Under normal operating conditions, persons shall be protected against inadvertent contact with active pulsed conductors.

  Where an electric fence is installed in an elevated position, such as on the inner side of a window or skylight, the physical barrier may be less than 1.5 m (5 ft) high where it covers the whole of the electric fence. If the bottom of the window or skylight is within a distance of 1.5 m (5 ft) from the floor or access level then the physical barrier need only extend up to a height of 1.5 m (5 ft) above the floor or access level.
- Pulsed conductors shall not be installed within the shaded zone shown in the following diagram:



- Where a physical barrier is installed in compliance with the above diagram, at least one dimension in any opening should be not greater than 130 mm (5 in) and the separation between the electric fence and the physical barrier should be:
  - within the range of 100 mm (4 in) to 200 mm (8 in) or greater than 1000 mm (39 in) where at least one dimension in each opening in the physical barrier is not greater than 130 mm (5 in);
  - greater than 1000 mm (39 in) where any opening in the physical barrier has all dimensions greater than 50 mm (2 in);
  - less than 200 mm (8 in) or greater than 1000 mm (39 in) where the physical barrier does not have any openings.
- Electric fence conductors should not be mounted on a support used for any overhead power line.
- The conductors of an Electric Security Fence should not be energized, unless all authorized persons, within or entering the secure area, have been informed of its location.
- Where there is a risk of persons being injured by a secondary cause, appropriate additional safety precautions should be taken. An example of a secondary cause is where a person may be expected to fall from a surface if contact is made with pulsed conductors.
- Electric security fences and their ancillary equipment shall be installed, operated and maintained in a manner that minimizes danger to persons, and reduces the risk of persons receiving an electric shock unless they attempt to penetrate the physical barrier, or are in the secure area without authority.
- Electric security fence constructions that are likely to lead to the entanglement of persons shall be avoided.

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- Gates and access ways through an Electric Security Fence shall be capable of being secured and opened without the operator receiving an electric shock. If the gate or access way is used for personnel access, a method to eliminate any HV electric pulses should be included to prevent inadvertent contact with the pulsed conductors.
- An electric security fence shall not be supplied from two separate energizers or from independent fence circuits of the same energizer.
- For any two separate electric security fences, each supplied from a separate energizer independently timed, the distance between the wires of the two electric security fences shall be at least 2.5 m (8 ft 2 in). If this gap is to be closed, this shall be effected by means of electrically non-conductive material or an isolated metal barrier.
- The Electric Security Fence and any associated structure should not contain barbed wire, or razor wire, unless it is constructed so simultaneous contact is prevented by a reach distance of at least 1 m (3 ft 3 in). The installation **must not** use electrified barbed wire or razor wire.
- Follow the energizer manufacturer's recommendations regarding earthing.
- The distance between any electric security fence earth electrode and other earth systems shall be not less than 2 m (6 ft 6 in), except when associated with a graded earth mat.
- Exposed conductive parts of the physical barrier shall be effectively earthed.
- Where an electric security fence passes below bare power line conductors, the highest metallic element shall be effectively earthed for a distance of not less than 5 m (16 ft 4 in) on either side of the crossing point.
- Connecting leads that are run inside buildings shall be effectively insulated from the earthed structural parts of the building. This may be achieved by using insulated high voltage cable.
- Connecting leads that are run underground shall be run in conduit of insulating material or else insulated high voltage cable shall be used. Care must be taken to avoid damage to the connecting leads due to the effects of vehicle wheels sinking into the ground.
- Connecting leads shall not be installed in the same conduit as the mains supply wiring, communication cables or data cables.
- Connecting leads and electric security fence wires shall not cross above overhead power or communication lines.
- Where crossing overhead power or communication lines cannot be avoided, it shall be made underneath the power line and as nearly as possible at right angles to it.

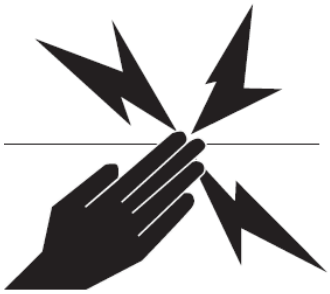
  The minimum clearances from power lines for electric security fences, shall not be less than those shown in the table below:

Power Line Voltage	**Clearance**
Less than or equal to 1000 V	3 m (9 ft 8 in)
Greater than 1000 and less than or equal to 33000 V	4 m (13 ft 1 in)
Greater than 33000 V	8 m (26 ft 2 in)

- If connecting leads and electric security fence wires are installed near an overhead power line, their height above the ground shall not exceed 3 m.
- This height applies either side of the orthogonal projection of the outermost conductors of the power line on the ground surface, for a distance of:
  - 2 m (6 ft 6 in) for power lines operating at a nominal voltage not exceeding 1000 V
  - 15 m (49 ft 2 in) for power lines operating at a nominal voltage exceeding 1000 V

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- A spacing of 2.5 m (8 ft 2 in) shall be maintained between uninsulated electric security fence conductors or uninsulated connecting leads supplied from separate energizers. This spacing may be less where conductors or connecting leads are covered by insulating sleeving, or consist of insulated cables rated to at least 10 kV.
- This requirement need not apply where the separately energized conductors are separated by a physical barrier that does not have any openings greater than 50 mm (2 in).
- A vertical separation of not less than 2 m (6 ft 6 in) shall be maintained between pulsed conductors fed from separate energizers.
- The Electric Security Fence shall be identified by prominently placed Gallagher Warning Signs (G602xxx). Signs shall be legible from the secure area and the public access area.
  The warning signs shall be placed:
  - To be visible from both sides of the Electric Security Fence
  - On and beside each gate/access point
  - At every change of direction
  - At horizontal intervals not exceeding 10 m (30 ft)
  - At a height that ensures unobstructed view (e.g. eye level - 1.8 m (6 ft) or above).
  - On hazard notification boards as necessary for site health and safety requirements.
- Any part of an electric security fence that is installed along a public road or pathway shall be identified at frequent intervals by warning signs securely fastened to the fence posts or firmly clamped to the fence wires.
- The size of the warning sign shall be at least 100 mm (4 in) x 200 mm (8 in). The background colour of both sides of the warning sign shall be yellow. The inscription on the sign shall be black and shall be either:
  - The substance of "CAUTION: Electric fence", or
  - The symbol shown below;



- The inscription shall be indelible, inscribed on both sides of the warning sign and have a height of at least 25 mm (1 in).
- Ensure that all Mains-operated ancillary equipment connected to the electric security fence circuit provides a degree of isolation between the fence circuit and the supply mains equivalent to that provided by the energizer.
- Mains supply wiring shall not be installed in the same conduit as signalling leads associated with the electric security fence installation.
- Protection from the weather shall be provided for the ancillary equipment unless this equipment is certified by the manufacturer as being suitable for use, and is of a type with a minimum degree of protection IPX4.

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3 Installation

3.1 Introduction

Please read the safety warnings before you install this product.

SAFETY WARNINGS:

- This product must be installed in accordance to the safety guidelines detailed in the topic *"Important information"* located earlier in this document.
- This product must be installed in accordance to the safety guidelines detailed in the document *"3E0654 Gallagher International Code of Practice - Perimeter Systems"*. This document can be downloaded from here: https://security-support.gallagher.com
- Ensure the product is fully assembled and all wiring has been completed, before turning the power on.
- This appliance is not intended for use by young children or infirm persons without supervision.
- Young children should be supervised to ensure that they do not play with the appliance.
- This energizer is fitted with polyvinyl chloride sheathed cords and should not be handled when the ambient temperature is below +5 °C (41 °F).
- Do not touch the HV connections (HV terminal block) when the AC mains power or battery is connected. Handle the Fence Controller using the long edge of the unit only.
- If it is required to temporarily disconnect power to the energizer, disarm the energizer before doing so. This will discharge the energy storage capacitors. Power can be reconnected at anytime.

  If power is removed from the energizer and the energy storage capacitors have not been discharged wait at least 45 seconds before reconnecting power. Re-connection of power at times less than 45 seconds may cause the energizer Fast Fire Protection to operate. If Fast Fire Protection operates this will prevent the energizer from producing pulses for up to 10 seconds and fence alarms will be produced.

3.2 Equipment you will need

Installation tools required are:

- 3.5 mm (1/8 in) drill bit
- 8 mm (5/16 in) drill bit (if using wall plugs/masonry)
- Power drill (hammer drill if mounting onto concrete)
- Phillips (cross head) screwdriver
- 0.8 mm (flat) screwdriver (for LV connections)
- Wire stripper (G20210) and wire cutters (G20211)

Additional components that are required to complete the installation are:

- Gallagher CAT 5e 4 twisted pair 24 AWG (0.2 mm^2) network cable (G10600)
- Ducting and ducting end terminations
- System components such as leadout cable, earth stakes and fence components

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3.3 Procedure

Complete the following procedure to install the Fence Controller:

1. Choose a location

Choose a location to mount the Fence Controller. Considerations are:

- Mains power availability.
- The mains power wall socket switch must be accessible to authorised users.
- Should be mounted in a shelter that is both hidden from casual observers but allows frequent access.
- Weather and extreme temperature protection.
- During charging, the lead acid battery requires a well-ventilated area.
- Sufficient space to accommodate the Fence Controller and Cable Manager(s) if used.
- Should be mounted as close as is practical to the fences it is connected to in order to minimise HV cabling requirements.
- The HBUS network length should not exceed 500 m (1640 ft) from the Gallagher Controller 6000.
- The LV sync network length should not exceed 1.2 km (3937 ft).

2. Consider temperature

This product generates heat. Careful consideration must be given to temperature increases, and the installation enclosure chosen for this product. Refer to the *"Temperature management"* section later.

3. Remove one LV cable entry knockout

There are 3 circular LV cable entry knockouts located on the base. Carefully consider where the low voltage cabling will be entering the unit. Using a drill, remove the appropriate LV cable entry knockout.

Note: The Gallagher Cable Manager (G21965) can be used to expand the low voltage cable area. The Cable Manager can also be used to house Gallagher I/O Expansion products.

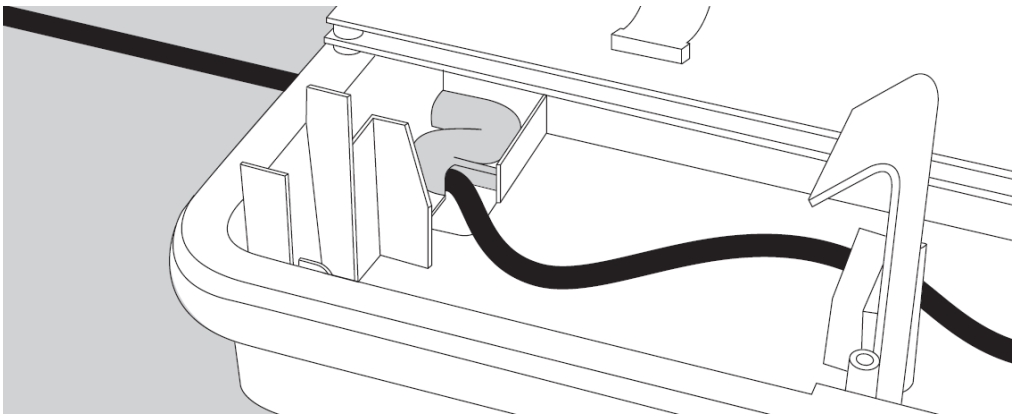
4. Mark the wall

Using the installation template on the back of the carton as a guide, drill all four mounting holes using a 3.5 mm (1/8 in) drill bit.

If mounting the base on a concrete or brick wall use an 8 mm (5/16 in) drill bit, a hammer drill, and the masonry plugs provided.

5. Insert the mains power cord

Insert the mains power cord (supplied by your approved Gallagher distributor) into the mains entry hole and "S Bend" strain relief.

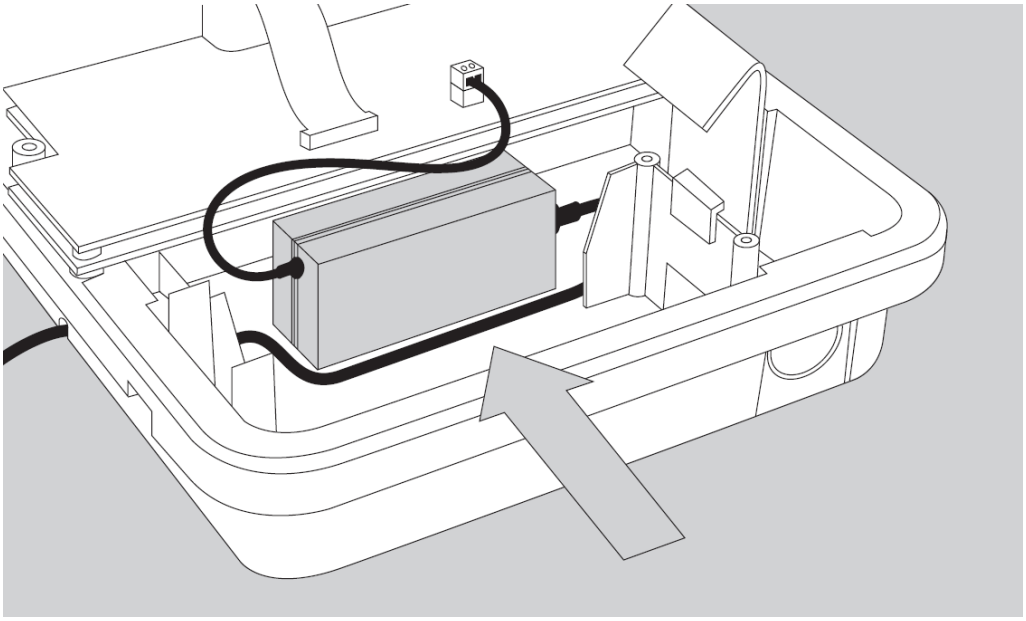


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6. Connect the power supply unit

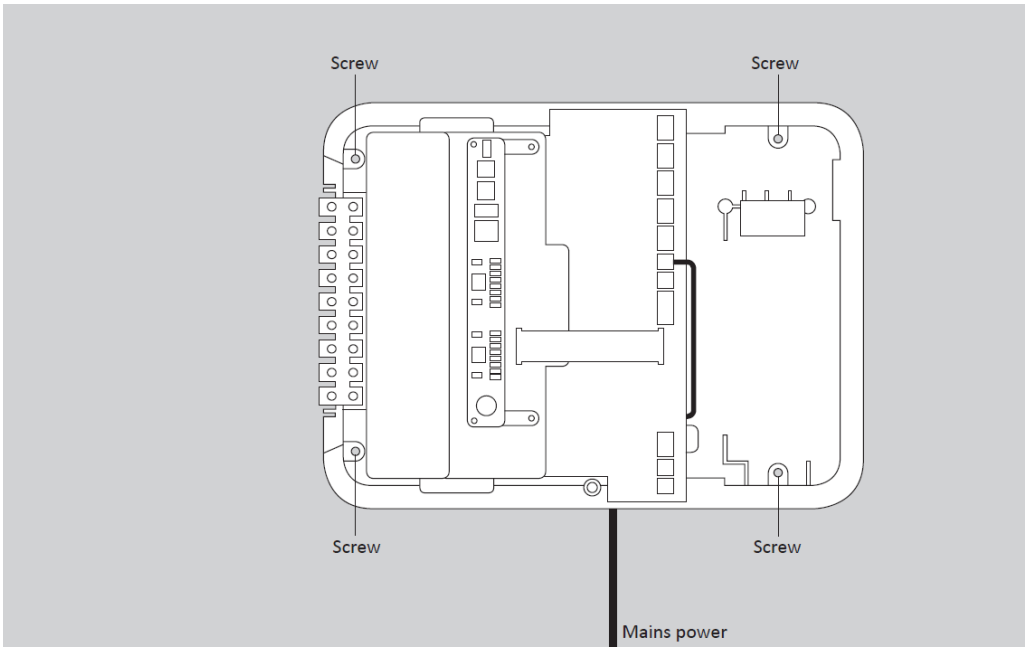
Pull out the power supply unit (G21961), located under the energizer board and plug the power cord into the figure 8 socket. Return the power supply unit to its original position.

DO NOT plug into the mains power. DO NOT turn on the mains power.



7. Mount the Fence Controller

Using the four screws provided, mount the Fence Controller to the mounting surface. Ensure the unit is flush with and tight against the mounting surface.

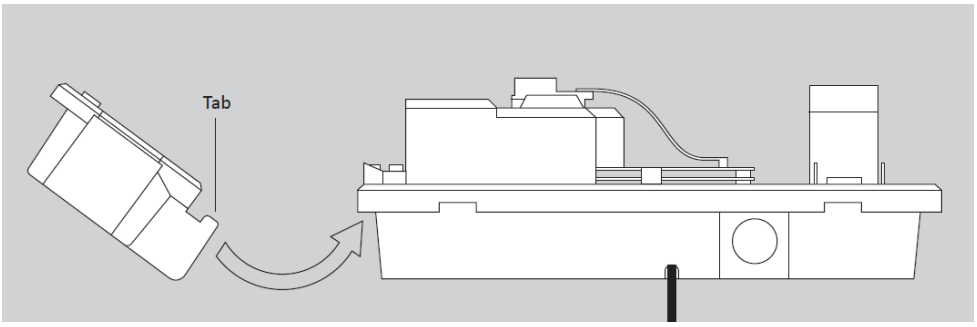


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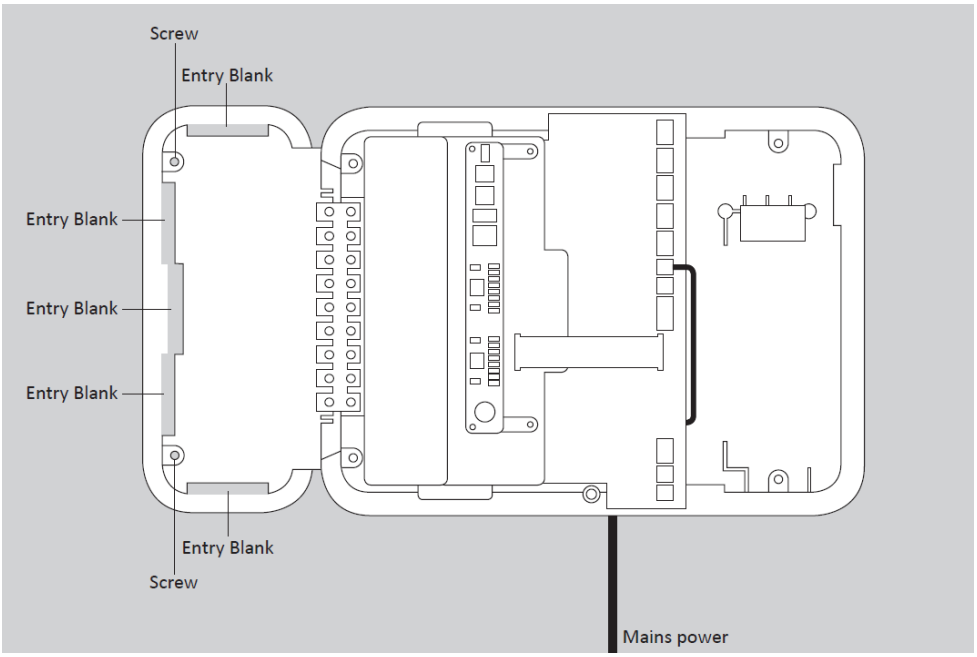
8. Mount the Cable Manager

If using the Gallagher Cable Manager (G21965), attach the Cable Manager to the Fence Controller

1. Angle the Cable Manager so that the tabs enter below the Fence Controller lip.



2. Push the Cable Manager down, so that it is flush and tight against the mounting surface. Secure the Cable Manager to the mounting surface, using the two screws provided.



3. Remove the appropriate Entry Blank, enabling wires to enter the Cable Manager. These blanks can accept up to 38 mm (1½ in) conduit and have drill start points to assist with fitting.

   Note: The Cable Manager can be fitted to either end of the Fence Controller and used to route cables or house Gallagher ¼ or ½ footprint PCB modules.

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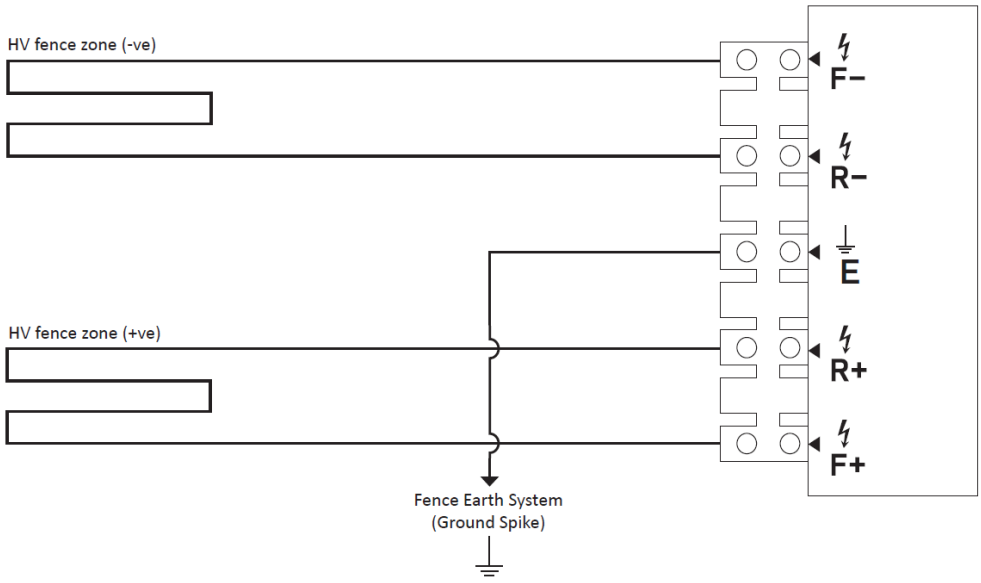
9. Connect the HV cables

Strip 25 mm (1 in) of sheathing off the end of each cable. Connect the HV cables to the terminal block. The terminal block has two screws per input/output. Screw down **both screws** to firmly secure the HV cable.

Construct the fence as detailed in document *"3E0901 - Technical Reference Manual - Perimeter Systems"*. This document can be downloaded from here: https://security-support.gallagher.com

Notes:

- Connect the earths of multiple Fence Controllers together.
- HV fence cables should be kept separate from all other cable types. The HV cable entry can accommodate up to 38 mm (1½ in) round conduit.



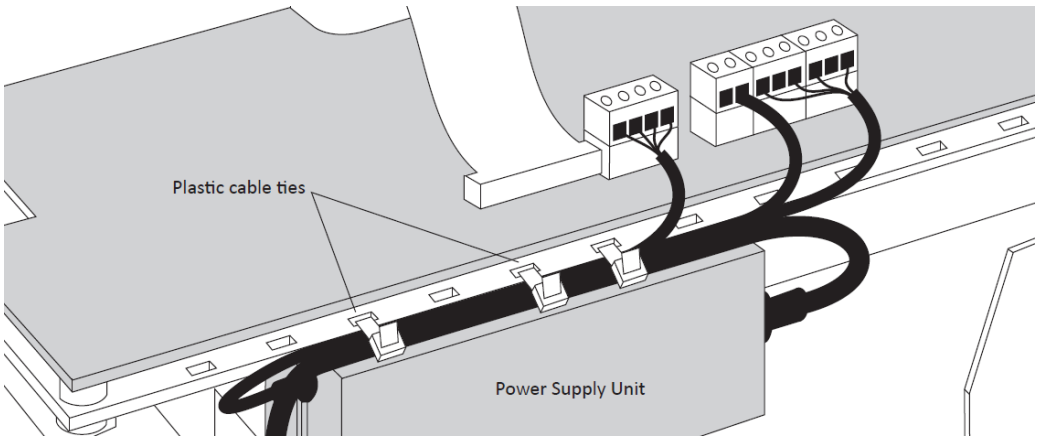
10. Connect the LV cables

Insert the low voltage cables through the LV cable entry knockout and connect to the appropriate connections.

Use plastic cable ties to secure the low voltage cables to the PCB shield (located directly below the PCB). Slots have been provided within the PCB shield.

Notes:

- If synchronising the pulse rate for multiple Fence Controllers, connect the LV sync network cable.
- The number of Inputs and Outputs available is determined by the Fence Controller type.



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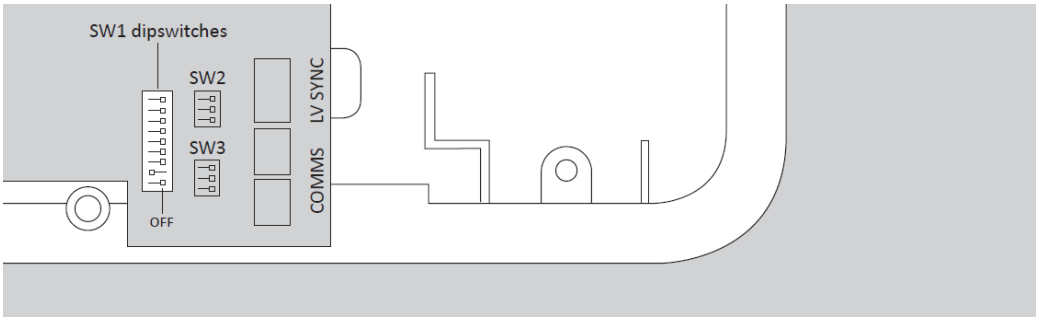
11. Set the SW1 dipswitches

To operate in Stand Alone mode, ensure SW1 dipswitch 9 is set to OFF (this is the default). Configuration will be controlled using the SW1 dipswitches.
Note: When in Stand Alone mode the Comms LED will be off at all times.

To operate in HBUS mode, set SW1 dipswitch 9 to ON, power cycle the Fence Controller and ensure the HBUS network cable is connected. Configuration will be controlled from Command Centre.

#	SW1	ON	OFF
9	Stand Alone / HBUS	The Fence Controller will operate in HBUS mode. Configuration is received from Command Centre. Dipswitches 2-8 are ignored. After setting this dipswitch power cycle the Fence Controller.	**Default:** The Fence Controller will operate in Stand Alone mode. Configuration is controlled using dipswitches 1-8.
8	LV Sync Master	The Fence Controller is the LV synchronization master. This setting is only used if dipswitch 7 if OFF.	**Default:** The Fence Controller is the LV synchronization slave.
7	HV Sync	The Fence Controller is the HV synchronization master and LV synchronization master. An F31 Fence Controller cannot be an HV synchronization master because R +ve is not available.	**Default:** The Fence Controller is the HV synchronization slave.
6		Not Used	
5		Not Used	
4		Not Used	
3	Int Battery Bypass	Using an external battery. Battery monitoring is supported.	**Default:** Using an internal battery. Battery charging, testing and monitoring is supported.
2	Tamper	**Default:** Optical tamper is enabled.	The optical tamper is disabled.
1	Service Mode	The Fence Controller is in Service Mode. Both fence zones are initially disarmed. The Fence Controller no longer responds to input state changes or Command Centre to arm or disarm the fence zones.	**Default:** The Fence Controller is in normal operating mode. The fence zones immediately follow the status set by the inputs or Command Centre.

SW1 dipswitch location



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12. Termination and bias

LV sync network

The LV sync network is used to synchronise the pulse rate for multiple Fence Controllers. If using the LV sync network, terminate the end devices on the LV sync network. Bias one device on the LV sync network (it is recommended you bias an end device). Refer to *"Synchronisation"* on page 27.

HBUS network

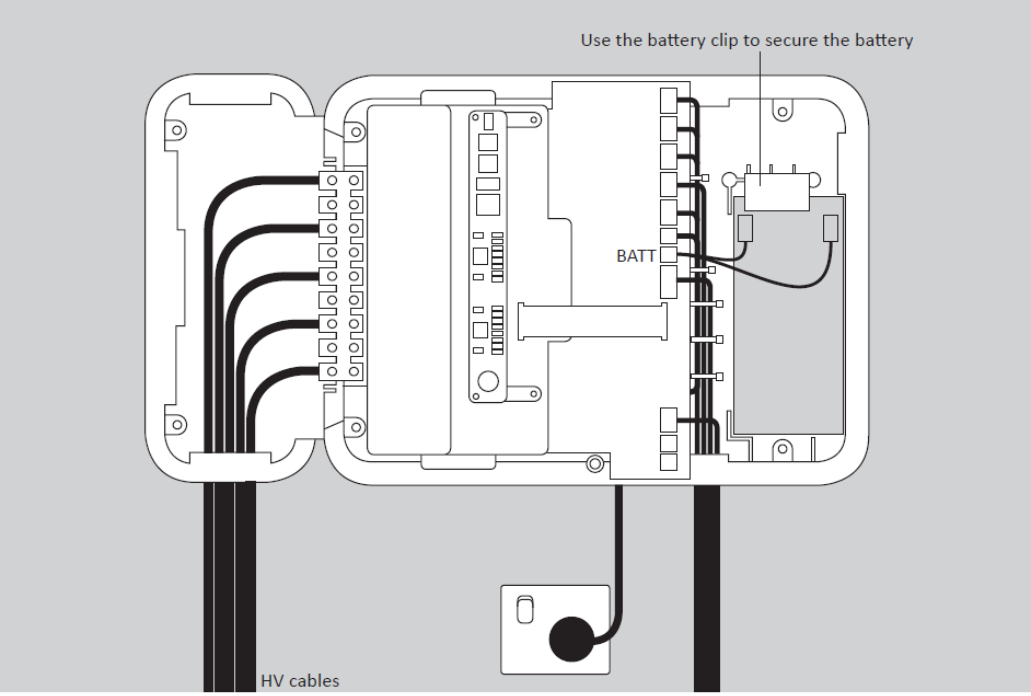
If operated in HBUS mode (the Fence Controller is connected to a Gallagher Controller 6000), terminate the end devices on the HBUS network. Refer to *"Comms"* on page 25. The Controller 6000 and HBUS Module has built in bias.

13. Power on

Place the battery (12V 7Ah valve regulated lead acid battery) provided by your approved Gallagher distributor into the base.

Connect the battery lead provided. Connect the black wire to the battery negative terminal. Connect the red wire to the battery positive terminal.

Plug the battery lead connector into the BATT connection located on the energizer board. Plug the mains power cord into the wall socket and switch on.





SAFETY WARNING: The Fence Controller is on when it receives power from the mains power supply, internal battery, or an external power source.

Anytime the Fence Controller is on, the deterrent will be present, (i.e. anyone touching the fence or HV wires will receive a short, sharp, but safe shock).

14. If operated in HBUS mode, configure in Command Centre

Configure the Fence Controller in Command Centre. Refer to *"Configuring an F31/F32/F41/F42 Fence Controller"* in the Command Centre Configuration Client Online Help.

Note: The Fence Controller can only be used with Gallagher Command Centre vEL7.40 software (or later). Earlier versions of Command Centre do not support this product.

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15. Tamper calibration

Calibration of the on-board tamper detector will occur when one of the following conditions is met:

Note: Once the countdown timer for tamper re-calibration has started, if any SW1 dipswitch subsequently changes during the countdown period, the timer is restarted.

Stand Alone mode

Dipswitch	Action
Dipswitch 2 ON	60 seconds after dipswitch1 has been changed from ON to OFF.
Dipswitch 2 ON	10 seconds after power up.
Dipswitch 1 OFF	60 seconds after dipswitch 2 has been changed from OFF to ON.

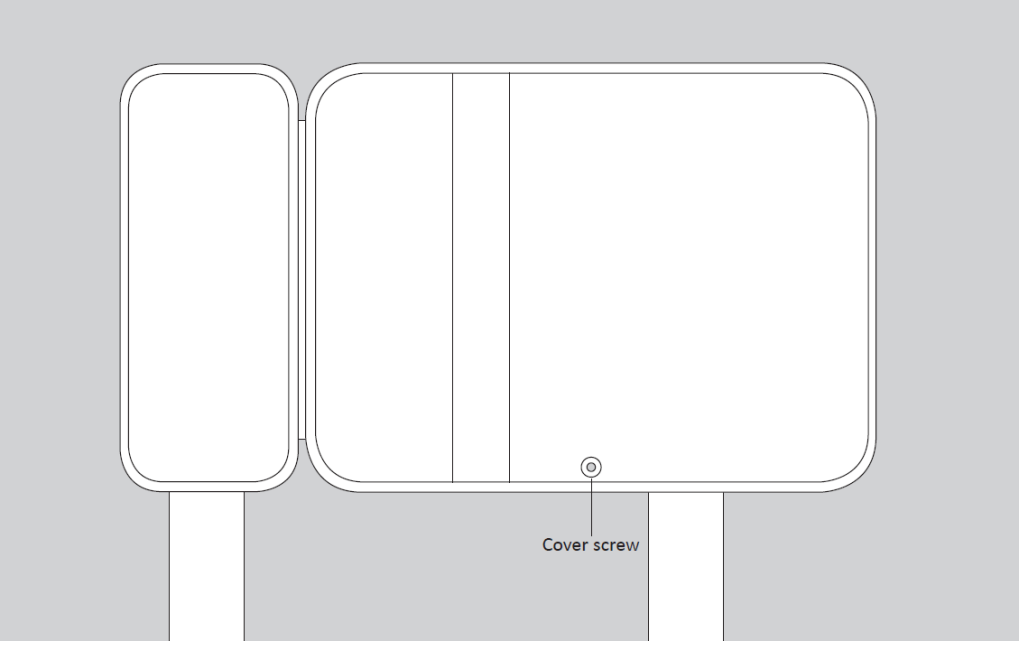
Note: When in Stand Alone mode the Comms LED will be off at all times so that it doesn't affect tamper calibration.

HBUS mode

When the Disable Tamper checkbox in Command Centre…	the tamper will be re-calibrated…
remains unchecked	either: • 60 seconds after dipswitch 1 has been changed from ON to OFF when the **Allow use of Service Mode for local control** checkbox is checked in Command Centre. • 10 seconds after power up. • 10 seconds after a **Reset** override has been performed on the Fence Controller in Command Centre.
is unchecked	10 seconds after.

16. Mount the cover

Mount the cover by clicking it into place. Secure the cover using the screw provided. If using the Cable Manager, mount the Cable Manager cover.



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17. Test the fence

Test the fence by creating a connection between the pulse and earth wire. An alarm will occur within 4 seconds of this connection.

Note: This is a temporary connection and can be created by hanging a bent piece of wire between the pulse and ground wire. During this process the fence should NOT be touched, as it will provide a short, sharp but safe shock.

To reset:

1. Turn the energizer off (mains power and battery power).

2. Remove the piece of wire.

3. Turn the energizer back on and ensure that the LEDs are flashing in time with the pulse.

18. Reset inactive alarms

To reset inactive (historic) alarms, perform one of the following actions:

Note: Inactive alarms will automatically reset 5 days after alarm restoral, (i.e. returned to normal).

- Present the magnetic key to either fence zone icon "-" or "+".
- Power cycle the Fence Controller (disconnect both mains power and battery).
- Perform a **Reset** override on the Fence Controller in Command Centre.

19. Remove the clear overlay

Remove the clear overlay, located above the icons on the Fence Controller cover.

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4 Cover icons

Icons are used to indicate the system and fence zone status. The icon will flash red (1 flash/second) when an active alarm is present. The icon remains solid red when an inactive (historic) alarm exists.

Icon	LED State	Diagnostic Indication
	1 Flash (Red)	Over-temperature alarm. The internal temperature is greater than 75 °C (167 °F). Once the internal temperature drops to below 65 °C (149 °F) the over-temperature alarm restores.
	1 Flash (Red)	Service alarm (internal module failure has occurred or the Service Mode SW1 dipswitch 1 has been set to ON).
	1 Flash (Red) Fast Flash (Red)	Tamper alarm (indicates cover has been removed). The tamper re-calibration countdown is in progress.
	1 Flash (Red)	Mains power supply failure alarm.
	1 Flash (Red)	Battery test failed or battery missing alarm.
HV	On (Orange)	Fence zone is in High Voltage mode.
LF	On (Orange)	Fence zone is in Low Feel mode.
	1 Flash (Red)	Fence zone alarm (-ve).
	1 Flash (Red)	Fence zone alarm (+ve).
	Pulsed (Orange)	Provides an indication of the measured return voltage delivered from the previous pulse. If all the LEDs are lit then the return voltage is at or near its designed maximum. Even in an alarm situation one LED will be lit if pulses are being delivered to the fence.
	Off	Configured as an LV sync slave in Stand Alone mode (LV Sync Master SW1 dipswitch 8 is OFF) and no synchronisation signal is present.
	1 Flash (Red)	• Configured as an LV sync master and competing synchronisation masters are detected, or • configured as an LV sync slave in an LV sync network and no synchronisation signal is present.
	On (Green)	Correct operation: • Configured as an LV sync master, or • configured as an HV sync master and no HV synchronisation signal is present, or • configured as an LV sync slave and an LV synchronisation signal is present.
	1 Flash (Green)	Correct operation. Configured as an HV sync master and an HV synchronisation signal is present.

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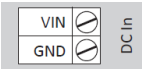
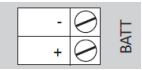
5 Power and battery management

5.1 Int Battery Bypass SW1 dipswitch 3

Dipswitch 3 controls how power and battery management is handled by the Fence Controller.

	Dipswitch 3 ON	**Dipswitch 3 OFF**
	Select if using an external battery. The Fence Controller expects a DC In and BATT voltage range between 12-15.75 V.	Select if using an internal 12 V 7Ah battery. The Fence Controller expects a DC voltage range between 15-15.75 V.
Battery charging	✘	✓
Battery testing	✘	✓
Battery monitoring	✓	✓

5.2 Connections

Power Supply		**Battery**	
	Ensure the power supply is connected to the **DC In** connection. This connection has a 5 A fuse that will blow if there is a fault on the energizer board.		Connect the battery cable to the **BATT** connection. This connection has a 5 A fuse that will blow if the battery terminals are reversed, or if there is a fault with the battery or energizer board.

5.3 Power Save mode

The Fence Controller will enter Power Save mode when one of the following conditions is met:

	Dipswitch 9	**Dipswitch 3**	**Power Supply**	**Result**
Condition 1	OFF	ON	DC In and BATT ≤ 11.5 V for 7-10 seconds	Go Slow mode is entered (the Fence Controller will skip every alternative pulse). A power failure alarm is raised and active.
Condition 2	OFF	OFF	DC In failed and BATT ≤ 11.5 V for 7-10 seconds	
Condition 3	ON	ON or OFF	DC In failed for ≥ 30 seconds	Power Save mode is entered. In Command Centre Power Save mode can be configured for either Go Slow mode (skip every alternative pulse) or Low Feel mode.
Condition 4	ON	ON or OFF	DC In and BATT ≤ 11.5 V for 7-10 seconds	

Note: Power Save mode is enforced even if the Fence Controller is part of a synchronised system. If the master Fence Controller enters Power Save mode, the slave Fence Controllers will pulse synchronised by the master at the normal pulse rate and voltage.

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5.4 Stop mode

The Fence Controller will enter Stop mode when one of the following conditions is met:

	Dipswitch 9	Dipswitch 3	Power Supply	Result
Condition 1	OFF	ON	DC In and BATT ≤ 11 V for 7-10 seconds	Stop mode is entered (pulsing is stopped). If a fence zone is armed, a fence zone alarm is raised and active.
Condition 2	OFF	OFF	DC In failed and BATT ≤ 11 V for 7-10 seconds	
Condition 3	ON	ON or OFF	DC In and BATT ≤ 11 V* for 7-10 seconds	Stop mode is entered (pulsing is stopped).

* This value is configurable in Command Centre.

5.5 Battery selection

The Fence Controller is designed to house a 12 V 7Ah valve regulated lead acid battery.
The internal battery dimensions are:

- 151 mm (6 in) long,
- 65 mm (2.6 in) wide, and
- 97.5 mm (3.85 in) high (including the terminals)
  Terminals to be Faston tab 250, 6.35 mm (0.25 in) wide.

Warnings:

- Non-rechargeable batteries should not be used while the Fence Controller is powered by the mains.
- A battery larger than 7 Ah must not be used with the internal charging functionality of the Fence Controller.

5.6 Battery replacement

Remove power from the Fence Controller (disconnect the mains power supply) before removing the old battery. Dispose of the old battery in a safe manner, refer to *"Battery disposal"* below.

Power cycling the Fence Controller after a battery replacement will clear the active battery alarm and schedule the next battery test to occur in approximately 24 hours. If you do not power cycle the Fence Controller the battery alarm will remain active until the next successful battery test. This may take up to 14 days.

Note: You should ensure the replacement internal battery is fully charged to avoid site security being compromised from a mains failure occurring before the replacement battery has had time to charge.

5.7 Battery disposal

- Leaking batteries should be removed. Avoid contact with any leaked material.
- Contact your local battery agent for advice and assistance in the safe disposal of your battery.
- The battery must be removed from the Fence Controller before it is scrapped.

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5.8 Battery charging

The Fence Controller includes an internal battery charger. There are three modes of operation:

1. Trickle Charge
   This is initiated if the battery voltage is less than or equal to 10 V.
2. Bulk Charge
   This is initiated if the battery voltage is greater than 10 V.
3. Float Charge
   Float charge occurs when the bulk charge has raised the battery voltage to the fully charged condition. This float voltage varies with temperature to match the temperature versus voltage characteristics of the lead acid battery.

A battery discharged to 11.25 V will take approximately 19 hours to fully charge.

5.9 Automated battery testing

The Fence Controller will automatically test the internal battery. When a battery test is due the Fence Controller stops charging the battery and switches to being powered from the battery. The battery voltage is then measured over a 30 minute test period.

The battery test is initiated 24 hours after the Fence Controller has started (power up) and then approximately every 14 days there-after. To initiate the test, at least one fence zone must be armed and the battery present (if not, will retry in 2 hours).

5.10 Battery and temperature

The ambient temperature surrounding the battery is approximately 13 °C (55 °F) (landscape orientation) higher than the ambient temperature surrounding the Fence Controller unit.

The ambient temperature surrounding the battery must be taken into account when selecting the battery for inclusion in the Fence Controller. For example, if the Fence Controller unit is operating in an ambient temperature of 50 °C (122 °F) the battery selected must be capable of operation at 60 °C (140 °F).

Note: Higher temperatures severely shorten battery life. For example, if the expected battery life of a battery is 2 years at 20 °C (68 °F) then this is reduced to 3 months at 60 °C (140 °F).

5.11 Battery venting

There is ventilation with a free area equal to 1.3 cm^2 within the Fence Controller enclosure.

There is no equipment which generates flames, sparks, arcing or glowing devices (max surface temp 300 °C) within 61 mm of the battery vents on the 7Ah battery. This measurement has been taken from the battery to the centre of the 5 A glass fuse. A vertical divider can be placed between the battery and the fuse to increase this distance, if required.

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6 Temperature management

The Fence Controller is equipped with an on-board temperature sensor. This sensor is located near the microcontroller and measures the internal temperature within the Fence Controller unit.

The ambient temperature operating range without loss of performance is:

Landscape orientation	Portrait orientation
-20 to +50 °C (-4 to +122 °F)	-20 to +40 °C (-4 to +104 °F)

The following table shows how the internal temperature of the Fence Controller responds to ambient temperature increases.

Internal measured temperature	Approximate ambient temperature per unit orientation	Comment
40 °C (104 °F)	16 °C (61 °F)	
60 °C (140 °F)	Landscape 37 °C (99 °F) Portrait 26 °C (79 °F)	**High temperature** status value. This value is applicable for Command Centre only. This value is configurable in Command Centre. When this value is exceeded, the Fence Controller can be configured to automatically trigger a relay to activate a fan or other cooling method. When the temperature has dropped by 10 °C (50 °F) below this value, the relay switches off.
75 °C (167 °F)	Landscape 52 °C (126 °F) Portrait 41 °C (106 °F)	**Very high temperature** status value. An over-temperature alarm is raised (temperature icon flashes red) and an alarm is generated in Command Centre. The Fence Controller will skip every alternative pulse (Go Slow mode). **Note:** In Command Centre Power Save mode can be configured for either Go Slow mode (skip every alternative pulse) or Low Feel mode. Once the internal measured temperature drops to below 65 °C (149 °F) the Fence Controller exits Power Save mode, the over-temperature alarm restores, and the system alarm relay returns to its normal state (assuming no other system alarm conditions are active).
85 °C (185 °F)	Landscape 62 °C (144 °F) Portrait 51 °C (124 °F)	**Critical temperature** status value. An alarm is generated in Command Centre. The Fence Controller enters Stop mode (cease producing pulses).

The following conditions apply to the above tables:

- All Fence Channels are functioning at maximum output with a pulse period of 1.1 seconds.
- The internal battery is being charged at the maximum current.
- The power supply unit is fitted within the Fence Controller unit.
- All relay coils are powered.
- 0.7 A is drawn from the COMMS +ve connection.

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7 Inputs

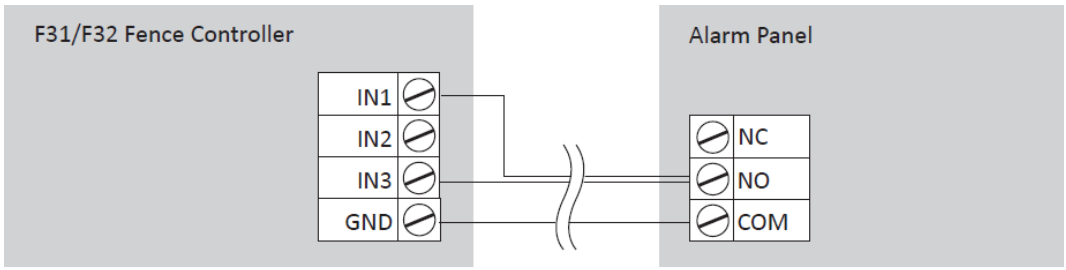
When in HBUS mode the input connections are configured in Command Centre. When in Stand Alone mode the input connections control the fence zone as follows:

Input	Input open (default)	Input closed
IN1	Fence zone (-ve) disarmed	Fence zone (-ve) armed
IN2	HV mode (both zones)	Low Feel mode (both zones)
IN3	Fence zone (+ve) disarmed	Fence zone (+ve) armed

Cabling should be a minimum size of 24 AWG (0.2 mm^2) for all input connections.

7.1 Using common control inputs

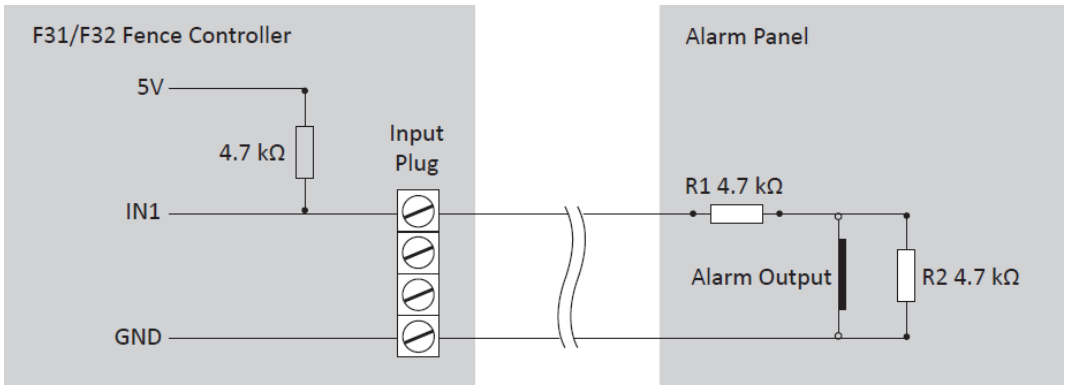
You may choose to common the zone control inputs on the Fence Controller, so that one relay on the alarm panel can be used to control (arm/disarm) both fence zones simultaneously.



7.2 Using balanced input (EOL resistors): HBUS mode only

To ensure correct tamper detection (short or open circuit), balanced inputs require 4.7 kΩ resistors to be connected as close as possible to the device being monitored.

When the monitored device incorporates a normally-closed (N/C) tamper switch, it can be wired in series with resistor R1.



If the Fence Controller is connected to a Gallagher Controller 6000, configure the resistor values using the Command Centre software (via the EOL Resistors property page). Refer to *"Configuring EOL Resistors for devices"* in the Command Centre Configuration Client Online Help.

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8 Relays

When in HBUS mode the output connections are configured in Command Centre. When in Stand Alone mode the output connections are used to indicate the system status as follows:

Output	System status
OUT 1	System alarm (battery missing, battery test failure, tamper, over-temperature, LV sync slave-signal loss, conflicting sync masters, or Service Mode enabled). **Note:** Fence alarms are not raised by output 1. Entering Power Save mode does not raise a system alarm.
OUT 2	Power supply failure alarm.
OUT 3	Fence zone alarm (-ve).
OUT 4	Armed indication: on if either zone -ve or zone +ve is armed. Otherwise off.
OUT 5	Fence zone alarm (+ve).

8.1 Relay operation

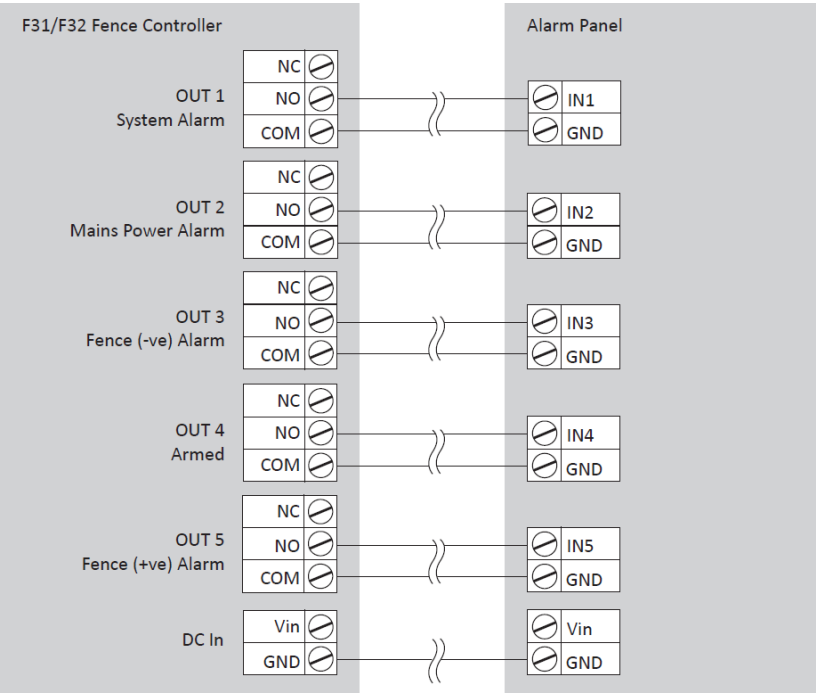
The relays 1, 2, 3 and 5 operate in "mimic" mode, (i.e. follow the alarm condition). These relays are connected as shown in the following table.

Alarm state	Relay power	Connection
No alarm	ON	N/O (normally open) is connected to C (common) when the relay is on
Alarm	OFF	N/C (normally closed) is connected to C (common) when the relay is off

Note: Relays 1, 2, 3 and 5 are powered when in the "No alarm" state so that if the Fence Controller loses power altogether (mains failure followed by battery failure), the outputs will indicate this as an alarm condition.

8.2 Using separate alarm panel inputs

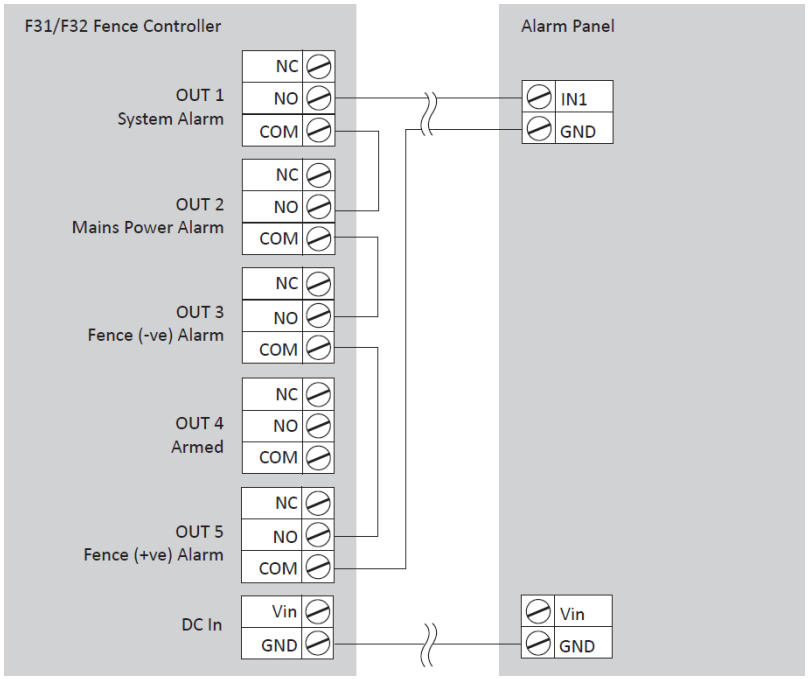
Each alarm panel input is triggered by a separate relay output.



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8.3 Using a single common alarm panel input

The single alarm panel input is triggered by any relay output.



9 Comms

The Fence Controller can be operated in HBUS mode, by connecting it to a Gallagher Controller 6000. The Fence Controller uses the encrypted HBUS communications protocol to communicate with the Controller 6000. The HBUS communications protocol is based on the RS485 standard and allows the Fence Controller to communicate over a distance of up to 500 m (1640 ft) from the Controller 6000.

Note: If the Fence Controller has been powered on in Stand Alone mode (SW1 dipswitch 1 is OFF), then switched to HBUS mode (SW1 dipswitch 1 is set to ON) you will need to power cycle the Fence Controller in order to connect to Command Centre.

9.1 HBUS cable

The recommended cable type for optimal HBUS performance is CAT 5e 4 twisted pair 24 AWG (0.2 mm^2) network cable. Two data wires (HBUS A and HBUS B) and a third common ground wire (-ve).

9.2 HBUS network topology

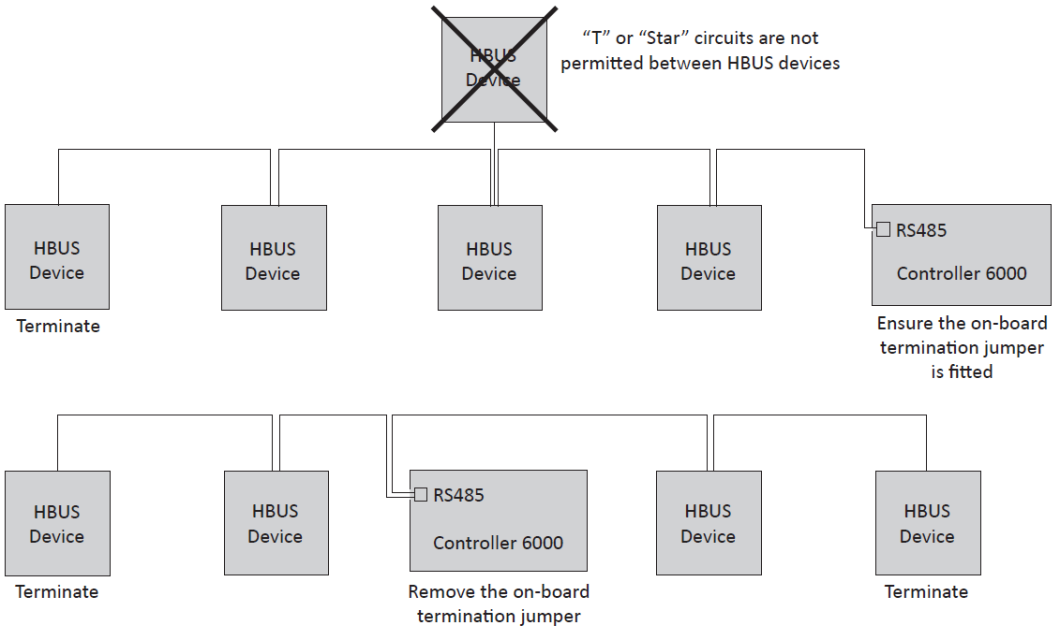
The cabling between HBUS devices should be done in a "daisy chain" topology, (i.e. A "T" or "Star" topology should not be used between HBUS devices).

9.3 HBUS termination

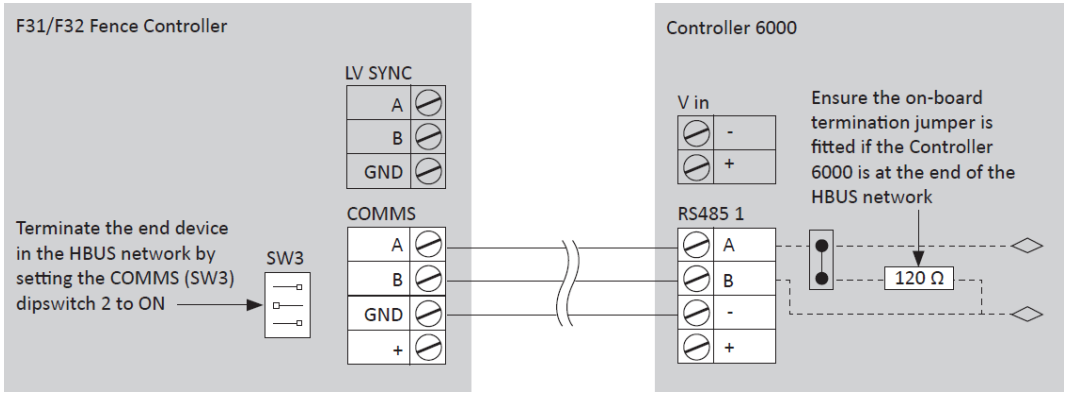
The end devices on the HBUS network should be terminated using 120 Ω resistance.

To terminate the Fence Controller set the COMMS SW3 dipswitch 2 to ON. To terminate at the Gallagher Controller 6000, ensure the on-board termination jumper is fitted for the appropriate RS485 port. Termination is already included at the HBUS Module, (i.e. each HBUS port is permanently terminated at the module).

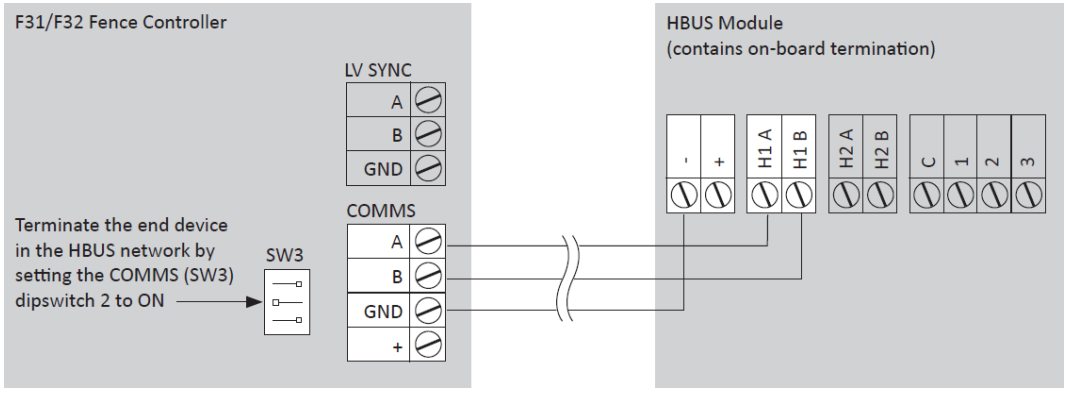
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9.4 Connecting to the Controller 6000



9.5 Connecting to the HBUS Module (attached to the Controller 6000)



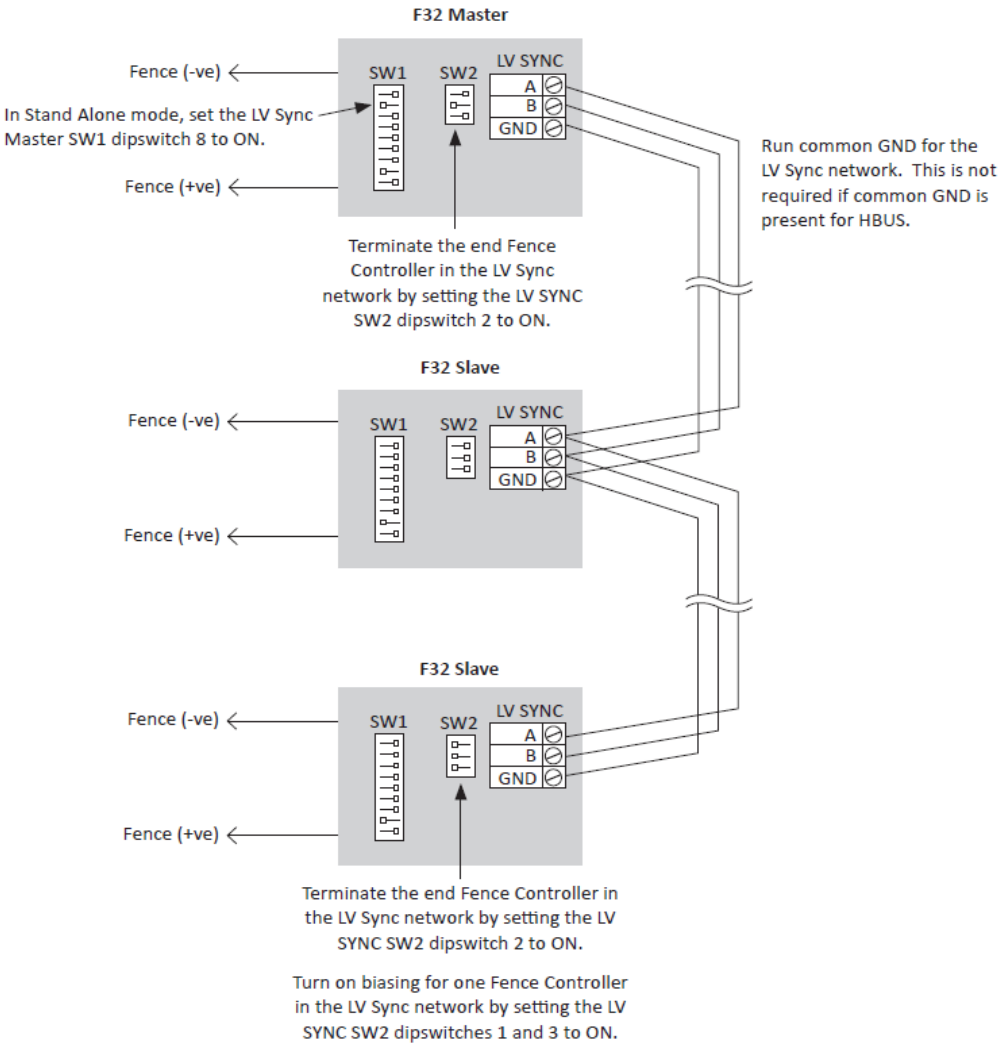
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10 Synchronisation

Synchronisation allows you to synchronise the HV pulses between two or more Fence Controllers. This may be required in a situation where there are two or more fences in close proximity, powered by different Fence Controllers. If a person comes into contact with two or more fences, the person may receive multiple HV pulses close together (if not synchronised).

10.1 LV synchronisation

The master Fence Controller will provide a low voltage synchronisation signal (copper synchronisation) to the other slave Fence Controllers. Gallagher F22 Fence Controllers can also be used within the same LV sync network as F31/F32/F41/F42 Fence Controllers.



Notes:

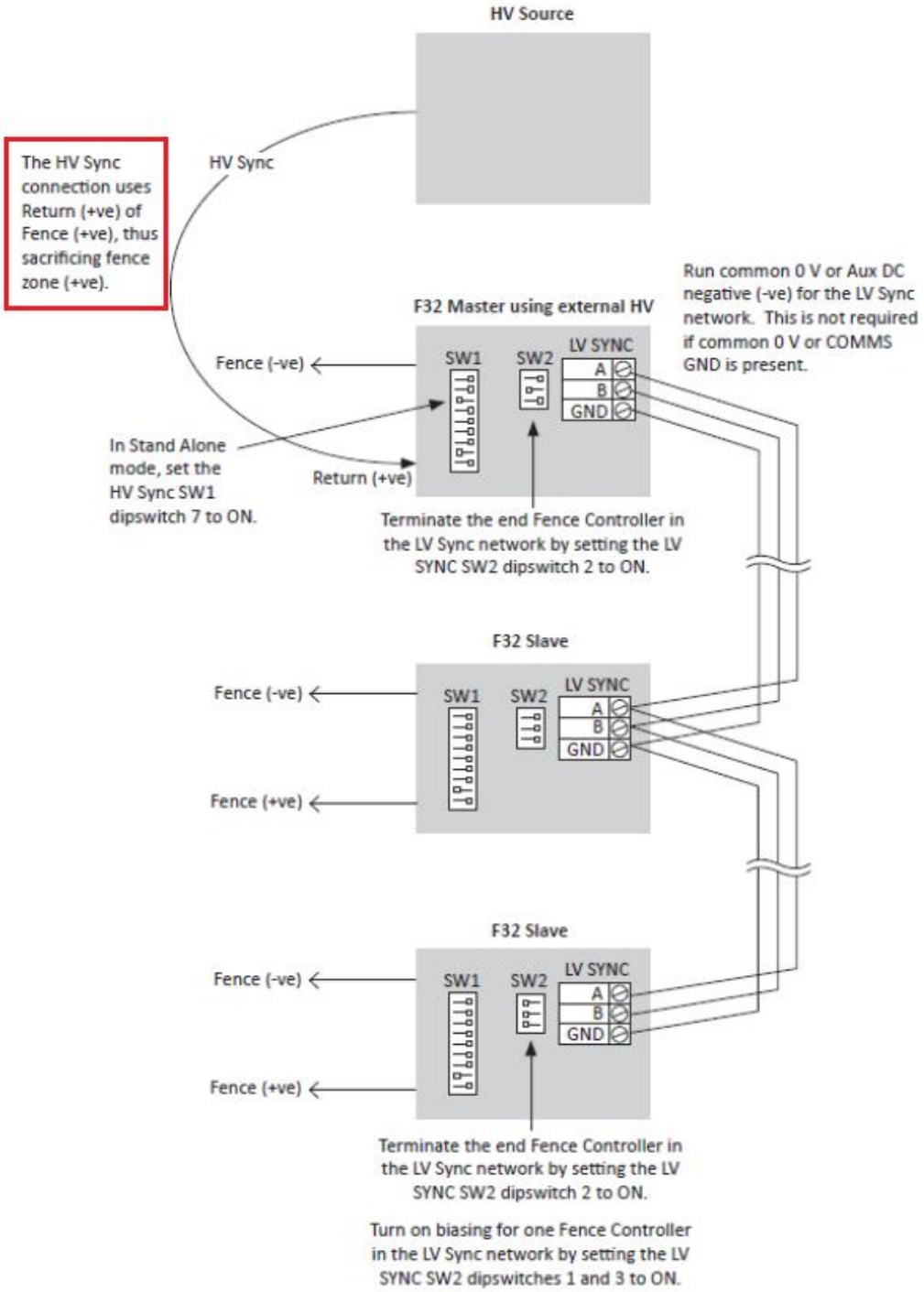
- Use CAT 5e 4 twisted pair 24 AWG (0.2 mm^2) cable for the LV sync network. The LV sync network length should not exceed 1.2 km (3937 ft).
- In Stand Alone mode, set the LV Sync Master SW1 dipswitch 8 to ON for the LV sync master in the LV sync network.
- Terminate the end Fence Controllers in the LV sync network.
- Bias only one Fence Controller in the LV sync network (typically the start or end device).
- If the master Fence Controller looses all power, all slave Fence Controllers will loose pulse synchronisation and will pulse un-synchronised.

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10.2 HV synchronisation

The master Fence Controller will provide a high voltage synchronisation signal (via Fence zone +ve) to the other Fence Controllers. The acceptable HV input range for the Fence Controller to synchronise from is between 1.6 kV to 9 kV.

If an F32 Fence Controller loses its HV sync, it will continue to pulse at its normal rate and the next Fence Controller will still be synchronised (via the LV SYNC).



Notes:

- HV synchronisation cannot be used on the F31 Fence Controller.
- LV sycnhronisation can be used to synchronise F31, F32, F41, F42 and F22 Fence Controllers together within one system.

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11 Service Mode

A service technician can use the magnetic key to arm or disarm a fence zone when servicing the Fence Controller. The magnetic key can also be used to reset all inactive (historic) system or fence zone alarms.



Note: The magnetic key can be used on any F31/F32/F41/F42 Fence Controller, it is not specific to an individual Fence Controller.



IMPORTANT: The Gallagher magnetic key contains a magnet that may be harmful if you have a pacemaker or other similar implanted device. Do not use the magnetic key if you have a pacemaker.

11.1 When in Stand Alone mode

To enter Service Mode, set the Service Mode SW1 dipswitch 1 to ON.

When Service Mode is entered:

- An active Service Mode alarm is raised (the Service icon on the Fence Controller is lit, red andflashing while the Fence Controller is in Service Mode). The alarm remains active and cannot be reset until you exit Service Mode.
- All system and fence alarms continue to be raised while in Service Mode. The alarms are visible via the Fence Controller icons.
- The fence zones are initially disarmed.
- The Fence Controller no longer responds to input state changes from the alarm panel to arm or disarm the fence zones. Relay 4 will continue to show the status as set by the inputs. This enables you to view what the fence zone status will be when Service Mode is exited.
- The Fence Controller continues to follow the set HV/LF mode and responds to any changes made to the HV/LF mode.
- The fence zone control via the magnetic key operates on a toggle; arming the fence zone if it is currently disarmed; disarming the fence zone if it is currently armed. Each fence zone operates independently by presenting the magnetic key to each fence zone icon "-" or "+".
- Presenting the magnetic key at either fence zone icon will reset all inactive alarms displayed on the Fence Controller.

When Service Mode is exited:

- The system alarm relay restores to its non-alarm state (assuming no other active system alarm conditions exist).
- The Service Mode alarm changes to inactive and can be reset.
- The fence zones immediately follow the status as set by the inputs.
- Presenting the magnetic key no longer arms or disarms the fence zones but will reset all inactive alarm conditions.

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11.2 When in HBUS mode

1. To enable Service Mode, check the **Allow use of Service Mode for local control** checkbox on the **Advanced** tab in the appropriate Fence Controller's properties.
2. To enter Service Mode, set the Service Mode SW1 dipswitch 1 to ON.

When Service Mode is entered:

- An active Service Mode alarm is raised (the Service icon on the Fence Controller is lit, red and flashing while the Fence Controller is in Service Mode). The alarm remains active and cannot be processed until you exit Service Mode.
- All system and fence alarms continue to be raised while in Service mode. The alarms are visible via the Fence Controller icons, in Command Centre and at a terminal.

  Inactive alarms reset at the Fence Controller will remain visible in Command Centre and at a terminal. Inactive alarms processed in Command Centre but not reset at the Fence Controller, remain visible at the Fence Controller.
- The fence zones are initially disarmed.
- The Fence Controller no longer responds to terminal or Command Centre state changes to arm or disarm the fence zones.
- The Fence Controller continues to follow the set HV/LF mode and responds to any changes made to the HV/LF mode.
- The fence zone control via the magnetic key operates on a toggle; arming the fence zone if it is currently disarmed; disarming the fence zone if it is currently armed. Each fence zone operates independently by presenting the magnetic key to each fence zone icon "-" or "+".
- Presenting the magnetic key to the Fence Controller will reset all inactive alarms displayed on the Fence Controller.

  Inactive alarms reset at the Fence Controller will remain visible in Command Centre and at a terminal. Inactive alarms processed in Command Centre but not reset at the Fence Controller, remain visible at the Fence Controller.

When Service Mode is exited:

- The Service icon on the Fence Controller is restored (solid red).
- The Service Mode alarm changes to inactive and can be processed.
- The fence zones immediately follow the status as set by Command Centre.
- Presenting the magnetic key no longer arms or disarms the fence zones but will reset all inactive alarm conditions.

Notes:

- If a fence zone is placed in Lockout mode from a terminal, no indication of Lockout mode is visible on the Fence Controller. When subsequently placed in Service Mode, the magnetic key cannot be used to arm/disarm fence zones that are in Lockout. The magnetic key will clear all inactive alarms.
- Placing the Fence Controller in Service Mode when the Fence Controller is offline or shunted has no effect on behaviour, (i.e. fence zones cannot be controlled via the magnetic key), even if Service Mode was enabled prior to the Fence Controller going offline or being shunted.
- If the Fence Controller is in HBUS mode and not connected to Command Centre, Service Mode cannot be entered.

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12 Technical Specifications

Specification	F31 Fence Controller	F32 Fence Controller
Power supply:	100-240 Vac 50/60 Hz	
Max power consumption (mains):	35 W 60 VA	45 W 80 VA
Average power consumption (mains):	30 W 48 VA	36 W 55 VA
Max power consumption (DC In):	32 W	40 W
Average power consumption (DC In):	27 W	32 W
Power supply unit:	G21961 (SMPS 15 V 2.4 A)	
Battery backup:	One 12 V 7Ah valve regulated lead acid battery (not included)	
Battery backup time in HV mode:	14 hours at a pulse rate of 1.5 seconds with no current taken from the Aux. DC output (COMMS +ve) 6 hours at a pulse rate of 1.5 seconds with 0.7 A taken from Aux. DC output (COMMS +ve)	10 hours at a pulse rate of 1.5 seconds with no current taken from the Aux. DC output (COMMS +ve) 5 hours at a pulse rate of 1.5 seconds with 0.7 A taken from Aux. DC output (COMMS +ve)
SW1 dipswitch 3 is OFF (default):	The expected internal battery voltage range is 15-15.75 V	
SW1 dipswitch 3 is ON:	The expected external battery voltage range is 12-15.75 V	
Aux. DC output (COMMS +ve):	11-15 Vdc, 0.7 A (resettable fuse)	
Fuse ratings (F500, F501):	5 A	
EOL resistors (for inputs):	4.7 kΩ	
Inputs per Fence Controller:	2	3
Outputs per Fence Controller:	4	5
Relay contact:	The power switched through a relay must not exceed 20 Vdc or 20 Vrms. 1 A DRY contact.	
Channels per Fence Controller:	1 (-ve zone)	2 (-ve zone, +ve zone)
HV (per channel):	8 kV [1] (without load)	
Low Feel (per channel):	0.9 kV [1] (without load)	
Pulse rate:	1 pulse every 1.5 seconds [1]	
HV alarm threshold:	Less than 2.0 kV [1] or greater than 15.0 kV [1]	
Low Feel alarm threshold:	Less than 0.3 kV [1] or greater than 10.0 kV [1]	
Unit weight:	2.95 kg (6.5 lb) (includes packaging - excludes battery)	3.7 kg (8.2 lb) (includes packaging - excludes battery)
Unit dimensions:	Fence Controller: 255 mm x 340 mm x 120 mm (10 in x 13.4 in x 4.7 in) Fence Controller with one Cable Manager connected: 255 mm x 452 mm x 120 mm (10 in x 17.8 in x 4.7 in)	
Ambient temperature range without loss of performance:	Landscape orientation -20 to +50 °C (-4 to +122 °F) Portrait orientation -20 to +40 °C (-4 to +104 °F)	
Environmental protection:	IPX4	
Max output energy (per channel):	2.3 J per pulse (into 200 Ω load)	
Max energy between interleave dual pulse connected zones:	4.5 J per pulse (into 400 Ω load)	
Max voltage between interleave dual pulse connected zones:	16 kV	

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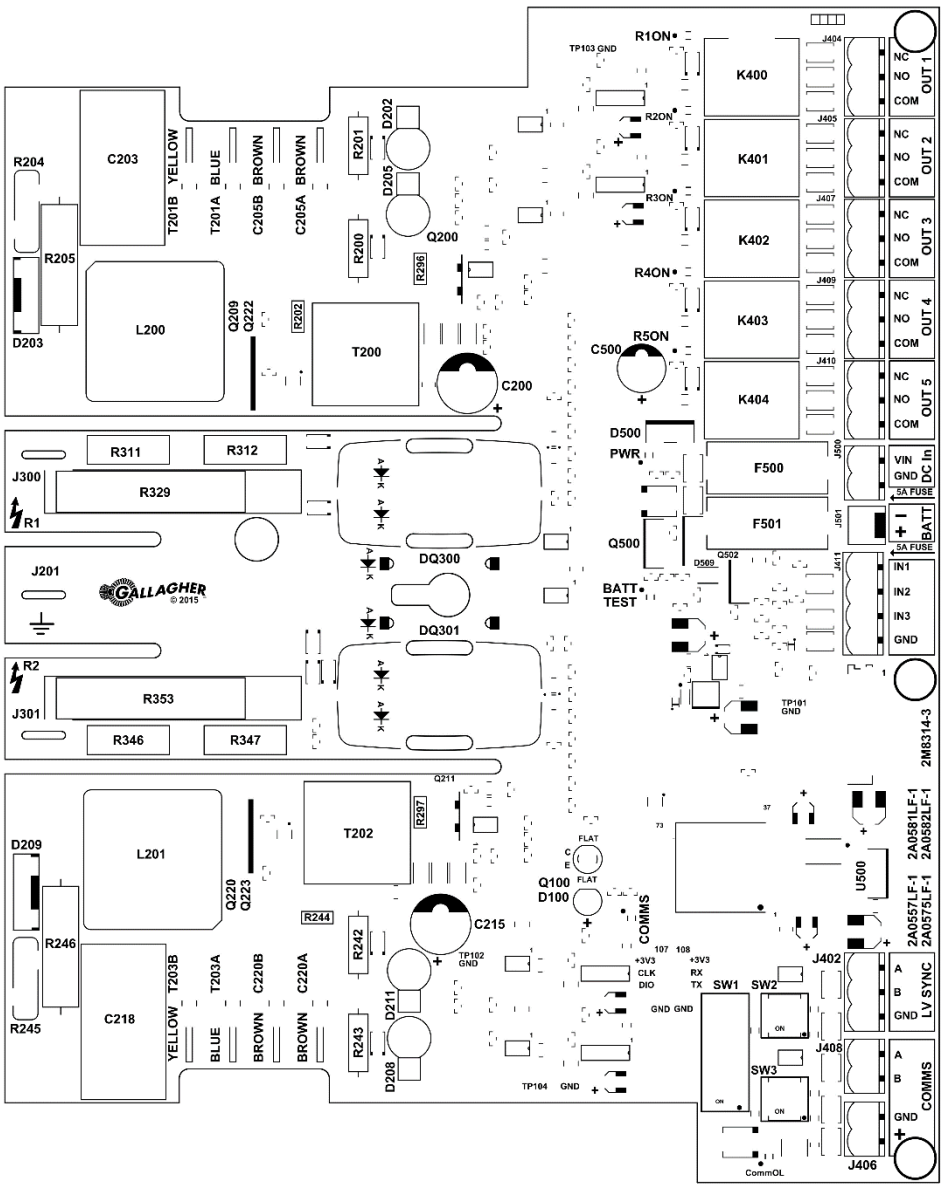
Specification	F31 Fence Controller	F32 Fence Controller
Max number of Fence Controllers on one HBUS cable:	24	

[1] This value is configurable in Command Centre.

The above values are typical when using a standard installation and default settings.

HBUS network	
Recommended cable type:	CAT 5e 4 twisted pair 24 AWG (0.2 mm^2) network cable
Maximum distance:	500 m (1640 ft) for the HBUS network
Speed:	RS485 1 Mbits/s

LV sync network	
Recommended cable type:	CAT 5e 4 twisted pair 24 AWG (0.2 mm^2) network cable
Maximum distance:	1.2 km (3937 ft) for the LV sync network
Speed:	RS485 19.2 kbits/s



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13 Approvals and Compliance Standards



This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you purchased the product.

RoHS COMPLIANT

This product complies with the environmental regulations for the Restriction of Hazardous Substances in electrical and electronic equipment (RoHS). The RoHS directive prohibits the use of electronic equipment containing certain hazardous substances in the European Union.

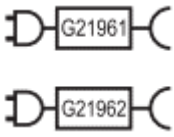
FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Changes or modifications not expressly approved by Gallagher Limited could void the user's authority to operate this equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



This symbol indicates that the separate power supply unit (G21961 or G21962) was used to power the Fence Controller during testing. This symbol is located on the outside of the Fence Controller near the mains power entry inlet. Using a different power supply unit may void the approvals and standards met by this Fence Controller.

UK CA

CE

SAA-151898-EA

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This product is complaint with the following safety standards when mounted vertical on a flat surface in a cabinet, and where the ambient temperature surrounding the product never exceeds 50 °C (122 °F). Methods for achieving this could be ventilation, forced ventilation or refrigeration.

APAVE-8969572

IEC 60335-2-76 Edition 2.2 2013-05
AS/NZS 60335.2.76:2003 Edition 2.1 Incorporating A1, A2 & A3
BS EN 60335-2-76:2005 + A2:2015
SANS 60335-2-76:2006 Edition 2.1

Part 2-76: Particular requirements for electric fence energizers.

Mains power supply cord

The mains power supply cord is not supplied with this product. The power cord will require an IEC C7 connector on one end, to plug into the Fence Controller power supply unit. The power cord should be no lighter than:

- ordinary polyvinyl chloride sheathed cord (code 60227 IEC 53);
- ordinary polychloroprene sheathed cord (code 60245 IEC 57).

The power cord should be rated at 105 °C (221 °F) for installations exposed to ambient temperatures greater than 40 °C (104 °F).

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