

Gallagher F22 Fence Controller



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



IMPORTANT: The Gallagher F22 Fence Controller can only be used with Gallagher Command Centre vEL7.05 software (or later). Earlier versions of Command Centre do not support this device.



Introduction

The Gallagher F22 Fence Controller

Thank you for purchasing this Gallagher F22 Security Fence Controller.

The Gallagher F22 Fence Controller supports 2 Fence Channels. Pulses are sent along each Fence Channel at a minimum of 1 second intervals. The end of the Fence Channel is connected back to the Fence Controller, where it measures the returning pulse.

The Gallagher F22 Fence Controller supports the connection of 2 relays and 3 inputs.

The Gallagher F22 Fence Controller interfaces with the Gallagher Command Centre security software. This software can interface to other systems or devices, such as sirens, access control, indicator panels, flood lighting, cameras and other devices of this nature.

Carton Contents

Check the carton contains the following items:

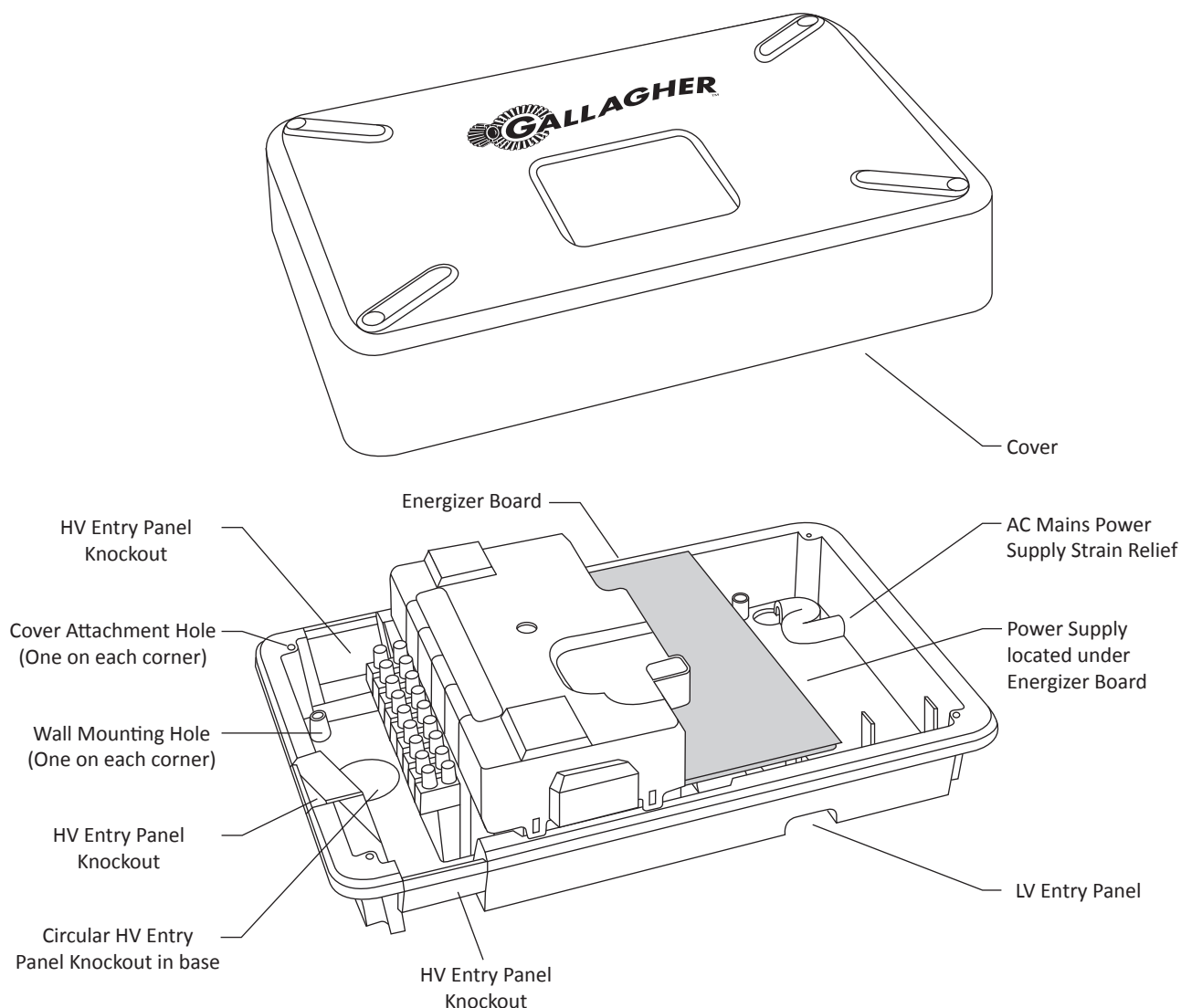
- 1 x Fence Controller cover
- 1 x Fence Controller base assembly
(with fitted power supply unit)
- 1 x Bag of small components
(4 x wall plugs, 4 x base screws, 4 x cover screws, and 1 x battery lead)

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

The power cord will require an IEC C7 connector on one end, to plug into the Fence Controller power supply. 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).



Installation

Introduction

The following procedure describes how to install the Gallagher F22 Fence Controller.

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 document "*Gallagher Perimeter Security Code of Practice*". This document can be downloaded from here: <http://support.gallagher.co>
- 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).

Equipment you will need

Installation tools required are:

- 3.5 mm (1/8") drill bit (wood)
- 8 mm (5/16") drill bit (wall plug/masonry)
- Power drill (hammer drill if mounting onto concrete)
- Phillips (cross head) screwdriver
- 3.0 mm terminal (flat) screwdriver
- 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 mm²) network cable (G10600)
- Ducting and ducting end terminations
- System components such as leadout cable, earth stakes and fence components

Procedure

Complete the following procedure to install the Gallagher F22 Fence Controller.
Note: This list can be used as a checklist to ensure you have completed all the necessary steps.

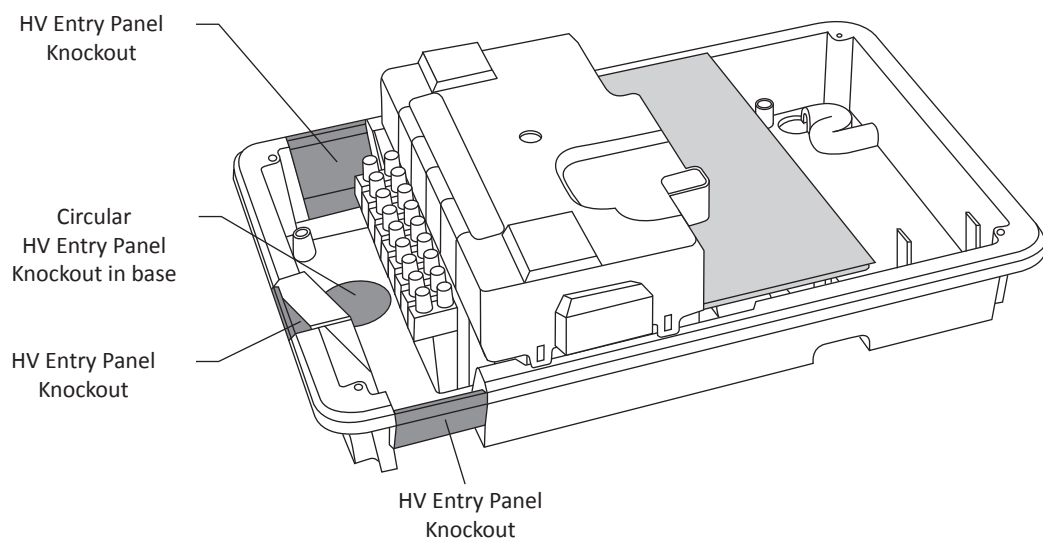
1. Choose a location

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

- AC mains power availability
- Should be mounted in a shelter that is both hidden from casual observers, but allows frequent access
- During charging, the lead acid battery requires a well-ventilated area
- The AC mains wall socket switch must be accessible to authorised users
- Weather and extreme temperature protection. The ambient temperature surrounding the Fence Controller should be within -20 to +50 °C (-4 to +122 °F)
- 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. Remove the HV wire entry panel knockout

Carefully consider where the HV wires will be entering the base and remove the appropriate HV entry panel knockout. To do this snap-off the knockout. There are three knockouts located on the sides of the base and a circular knockout located in the bottom of the base.



3. 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") drill bit.

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

4. Insert the power cord

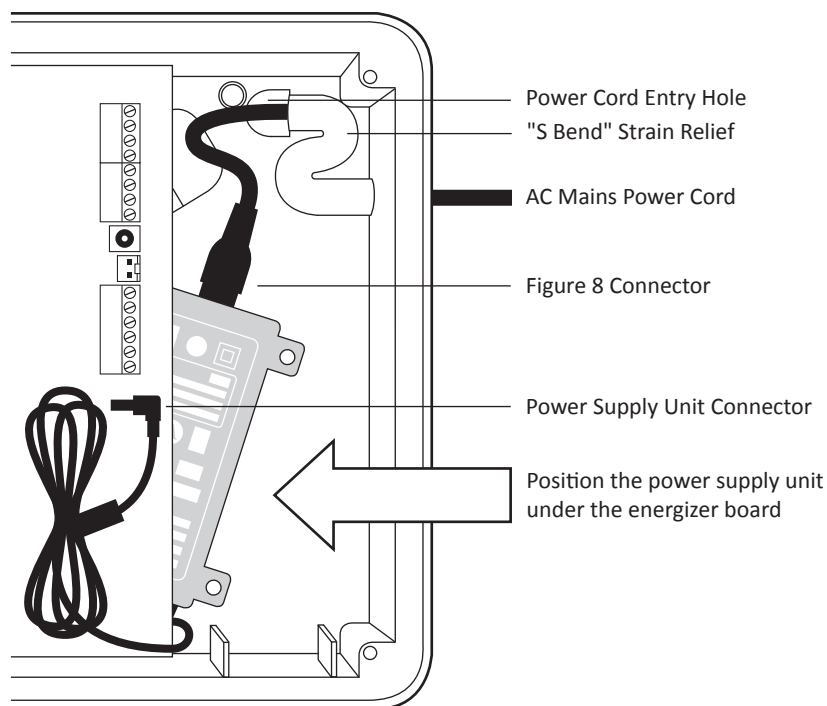
Insert the AC mains power cord (supplied by your approved Gallagher distributor) into the power cord entry hole and "S Bend" strain relief.

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

Important: The power supply unit must be positioned under the energizer board, with the tabs and text facing the energizer board. If positioned incorrectly, the battery will not fit.

Plug the power supply unit connector into the "DC In" connection.

DO NOT plug into the AC mains power yet



5. Mount the Fence Controller

Using the four screws provided, mount the Fence Controller to the wall.

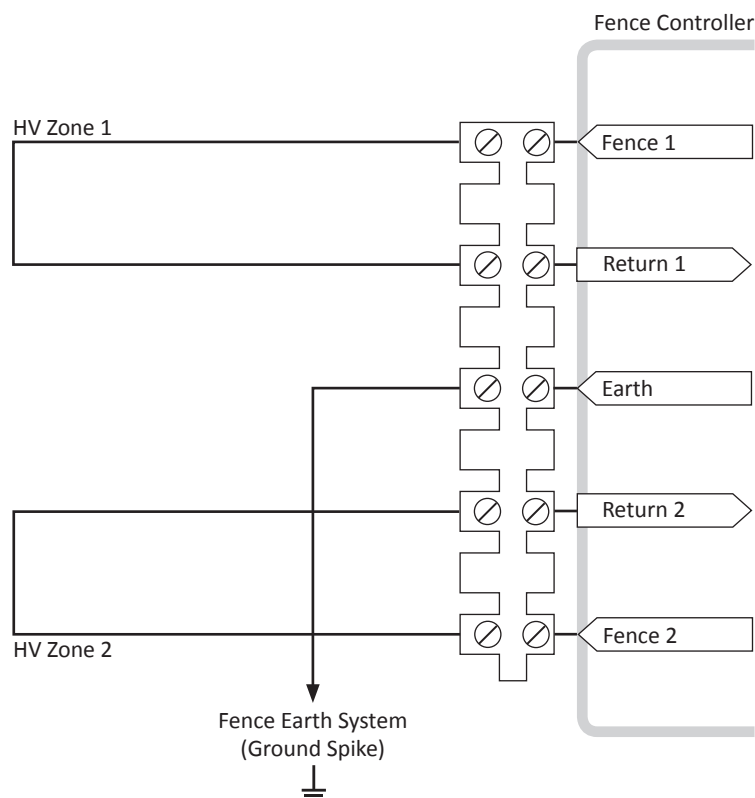
6. Connect the LV wires

Insert the low voltage external wiring (for the 2 relays, 3 inputs, LV Sync and COMMS) through the LV tunnel.

Connect to the appropriate low voltage connections. For details regarding low voltage connections, refer to the topic "*LV Connections*" later in this installation note.

7. Connect the HV wires

Strip 25 mm (1") of sheathing off the end of each wire. Insert the HV wires into the HV cable entry and pull through. Connect the HV wires to the terminal block. The terminal block has two screws per input/output. Screw down **both screws** to firmly secure the HV wire.

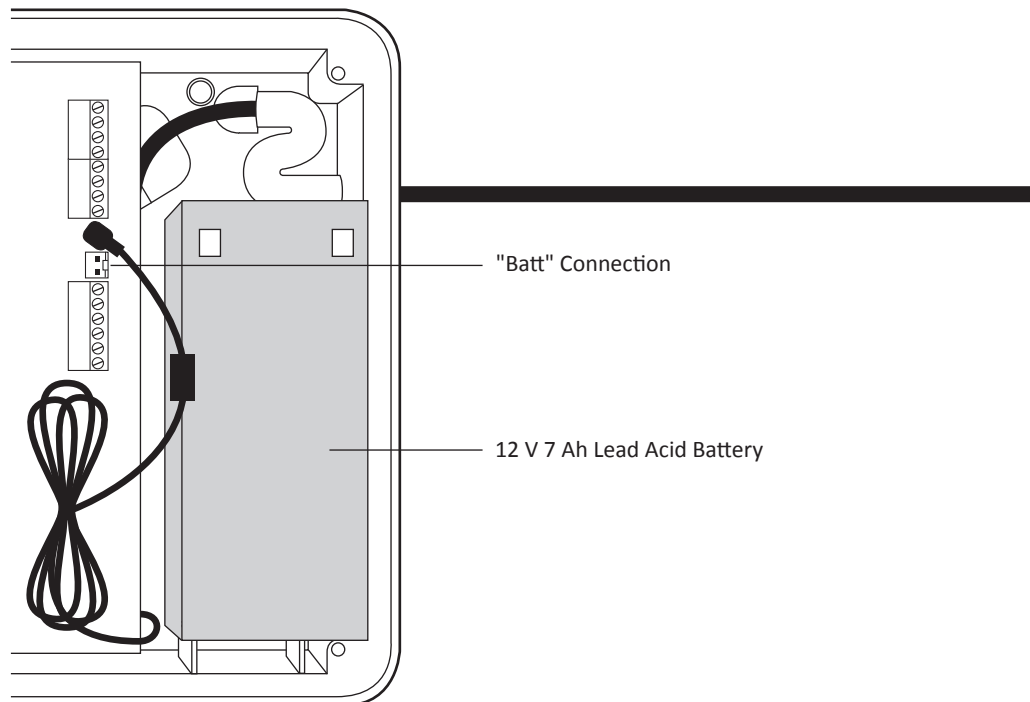


Notes:

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

8. Install the battery

Place the battery (12 V 7 Ah 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.

The battery has a 5 A fuse to protect the battery from excessive current.

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

SAFETY WARNING: The Fence Controller is on when it receives power from either the AC mains power supply or the battery, and when it has been configured in Command Centre.

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).

9. Mount the cover

Using the four screws provided, mount the cover to the base.

Note: You can choose to partially screw the screws into the cover, (i.e. 2 - 3 turns), then mount the cover and continue to turn the screws the rest of the way into the base.

Check the AC Mains Power icon (located on the cover) is on (green).

10. Configure the Fence Controller in Command Centre

Configure the Fence Controller using the Command Centre software. Refer to the topic "*Configuring an F22 Fence Controller*" in the Command Centre Help.

IMPORTANT: High Voltage/Low Feel Compatibility

The High Voltage/Low Feel functionality is only supported for sites running Command Centre vEL7.10 software (or later).

LV Connections

The following table identifies the LV connections on the energizer board. Refer to "*PCB Overlay*" at the rear of this installation note, for the location of the LV connections.

Connector	Purpose	PCB Location	PIN Numbers
RELAY 1	Relay 1 connection	J404	P1: N/C P2: N/O P3: C P4: –
RELAY 2	Relay 2 connection	J408	P5: N/C P6: N/O P7: C P8: –
DC In	DC In connection	J500	
Batt	Battery connection	J501	
INPUTS	Input 1 connection	J409	P9: I/P 1 P10: –
	Input 2 connection	J409	P11: I/P 2 P12: –
	Input 3 connection	J409	P13: I/P 3 P14: –
GPS	GPS connection	J101	
LV Sync	LV Sync connection	J402	P15: A P16: B P17: –
COMMS	HBUS connection	J405	P18: A P19: B P20: – P21: +

Relay outputs

Generically outputs are used to indicate the state of the system, (e.g. In alarm, armed, etc). This is configured in Command Centre.

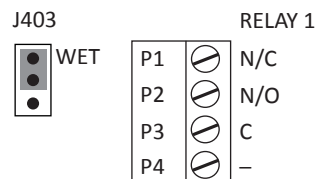
- N/O (normally open) is connected to C (common) when relay is activated (light on).
- N/C (normally closed) is connected to C (common) when relay is deactivated (light off).

The relay contacts can be configured for powered, or non-powered operation:

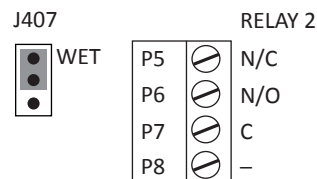
- **Powered (WET) operation**

- For Relay 1 place the jumper provided on pins 1 and 2 of J403.
- For Relay 2 place the jumper provided on pins 1 and 2 of J407.
- The voltage available is between 11 - 14.5 V
- The TOTAL current taken from both powered relay contacts must not exceed 0.5 A

Relay 1 WET Operation



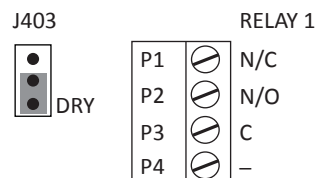
Relay 2 WET Operation



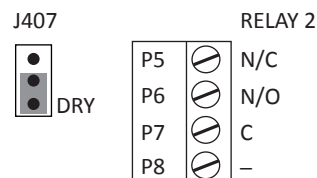
- **Non-powered (DRY) operation**

- For Relay 1 place the jumper provided on pins 2 and 3 of J403.
- For Relay 2 place the jumper provided on pins 2 and 3 of J407.
- When powered from an external source, the voltage must not exceed 20 Vdc or 20 Vrms
- The current taken from each relay contact must not exceed 0.9 A

Relay 1 DRY Operation



Relay 2 DRY Operation

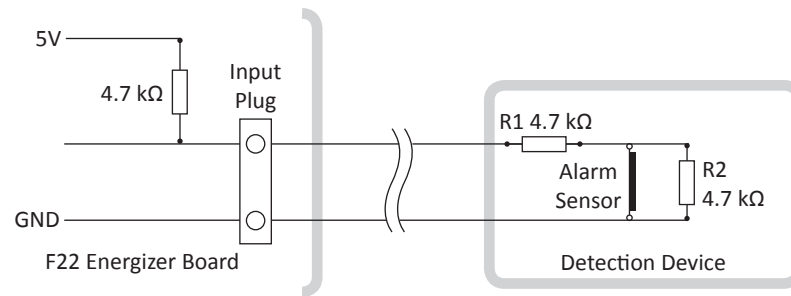


Balanced inputs

Cabling should be a minimum size of 24 AWG (0.2 mm²) for all balanced inputs.

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

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



Resistor values can be configured for a Fence Controller in Command Centre (via the EOL Resistors property page). Refer to the topic “*Configuring EOL Resistors for devices*” in the Command Centre Help.

COMMS

The Gallagher F22 Fence Controller uses the encrypted HBUS communications protocol to communicate with the Gallagher Controller 6000 only. 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).

HBUS cabling

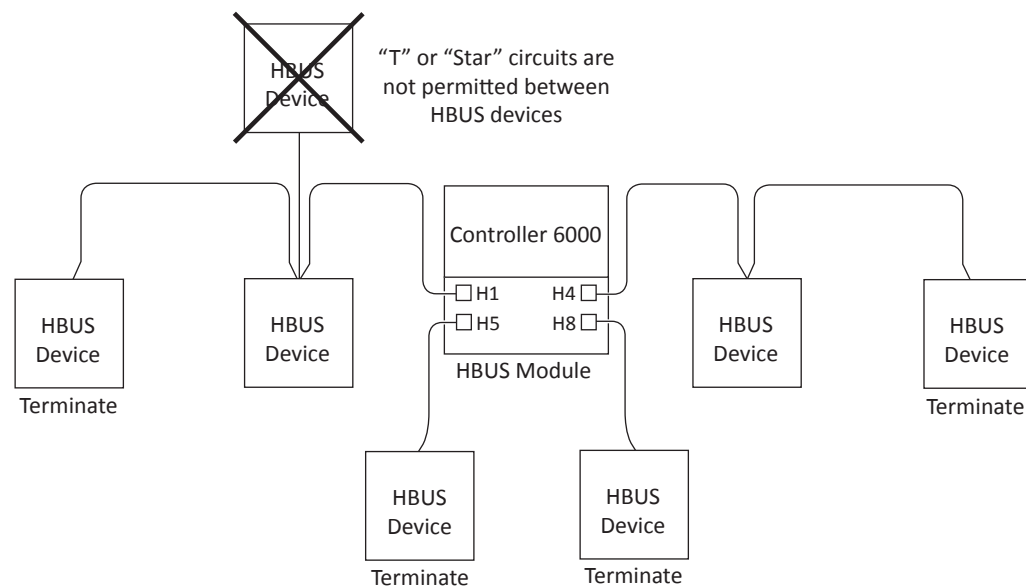
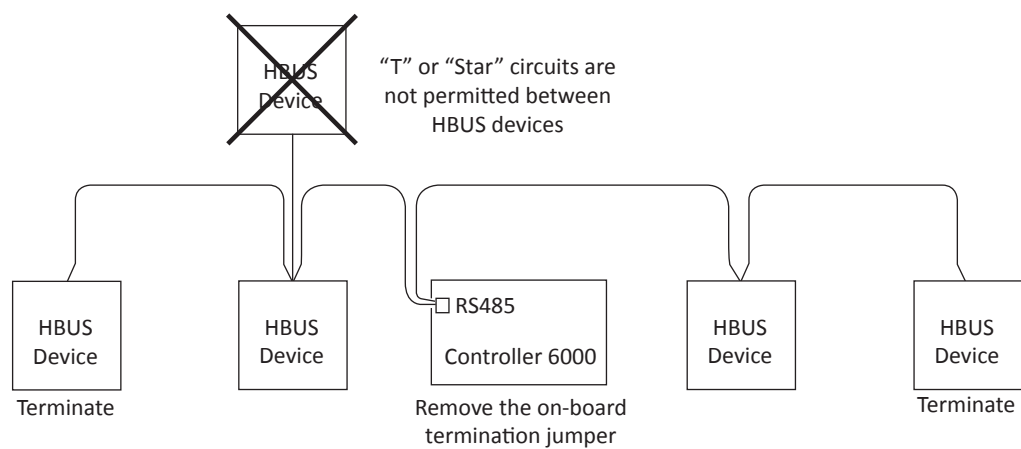
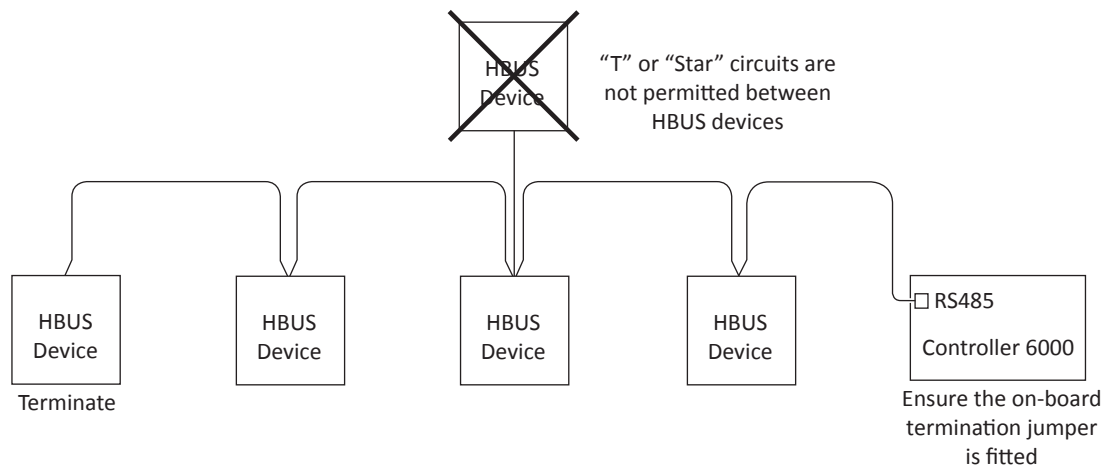
The recommended cable type for optimal HBUS performance is CAT 5e 4 twisted pair 24 AWG (0.2 mm²) network cable. Two data wires (HBUS A and HBUS B) and a third common ground wire (-ve).

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).

The end devices on the HBUS network should be terminated using 120 Ω resistance. To terminate at the Gallagher Controller 6000, ensure the on-board termination jumper is fitted for the appropriate RS485 port.

To terminate the Fence Controller, set the COMMS TERM DIP switch to ON (TERM = ON). Termination is already included at the HBUS Module, (i.e. each HBUS port is permanently terminated at the module).



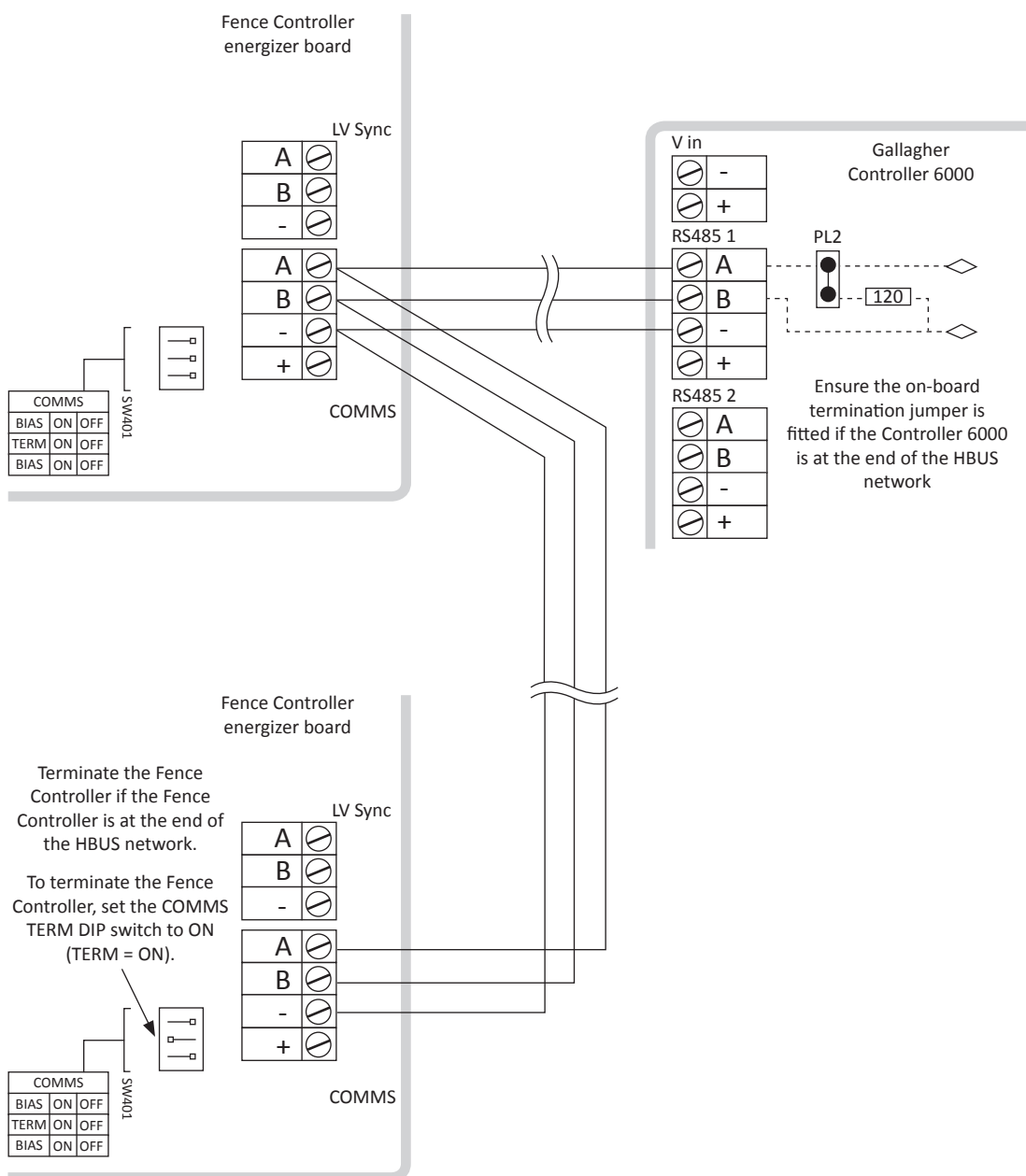
HBUS connections

The Gallagher F22 Fence Controller can be connected as an HBUS device to one of the following devices:

- Gallagher Controller 6000
- Gallagher HBUS Module (attached to the Controller 6000)

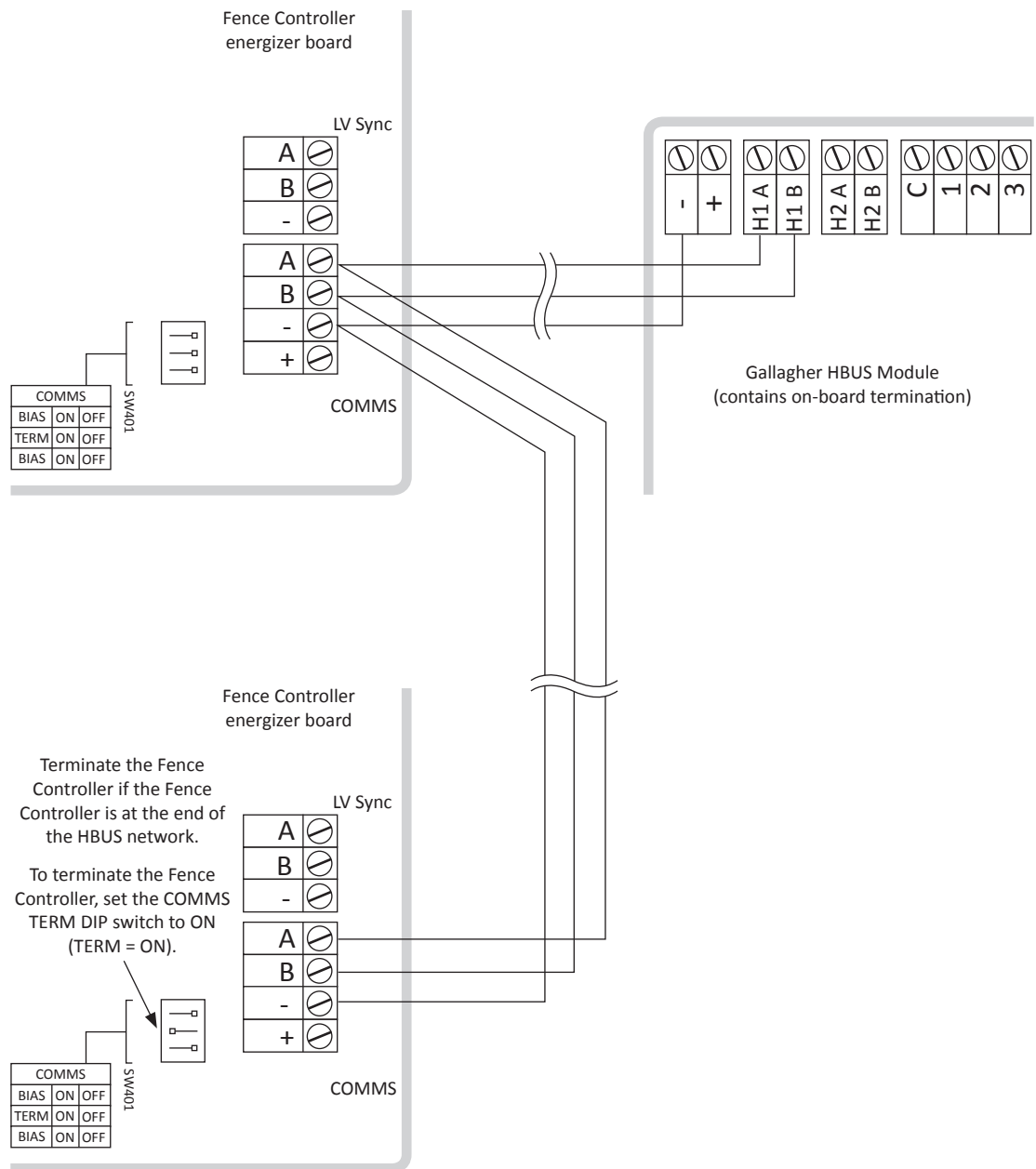
Connecting to the Gallagher Controller 6000

The Fence Controller connects to either RS485 port on the Controller as shown:



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

The Fence Controller connects to the ports as shown.



Using fibre cable

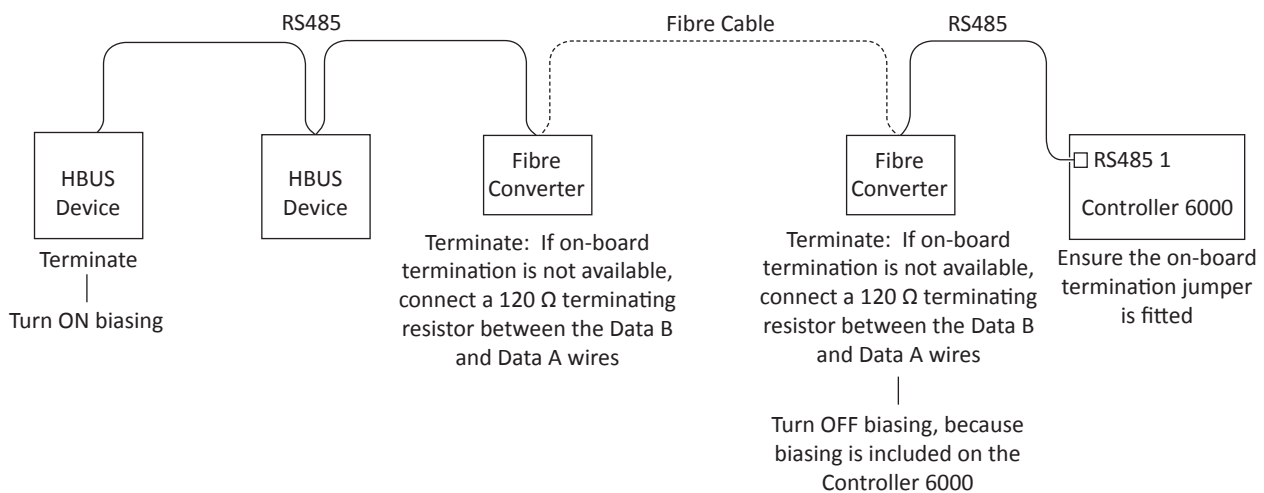
If required, fibre cable can be used to extend the distances of the HBUS network and LV Sync network. This must be done with considerations to terminations and biasing.

One device in an RS485 circuit must have biasing turned on. End devices in an RS485 circuit must be terminated.

If it is necessary to provide bias from the Fence Controller, set both COMMS BIAS DIP switches to ON (BIAS = ON, BIAS = ON). The Controller 6000 includes biasing circuitry internally in the RS485 ports, so there is no need for any other device connected to these ports to provide bias.

The following diagram illustrates how terminations and biasing has been configured for the HBUS network.

Note: Not all RS485 devices are marked correctly for Data (+) and (-), so if the slave devices don't respond after going through the fibre converter, try swapping the wire pair polarity at the converter. This will not cause damage.



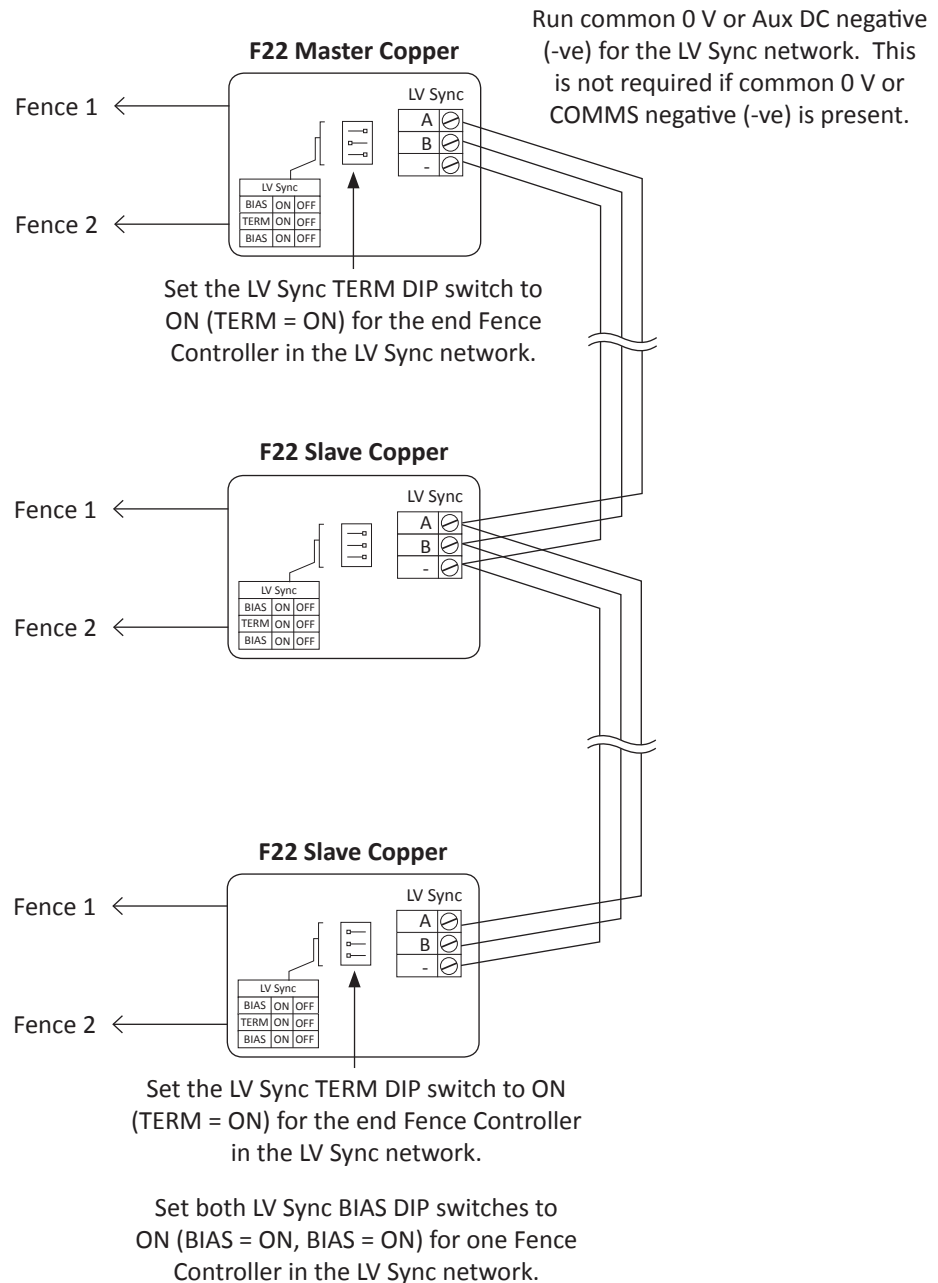
Synchronisation

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).

You will need to specify the synchronisation of each Fence Controller in Command Centre.

LV Synchronisation

The master Fence Controller will provide a low voltage synchronisation signal (copper synchronisation) to the other slave Fence Controllers.



Notes:

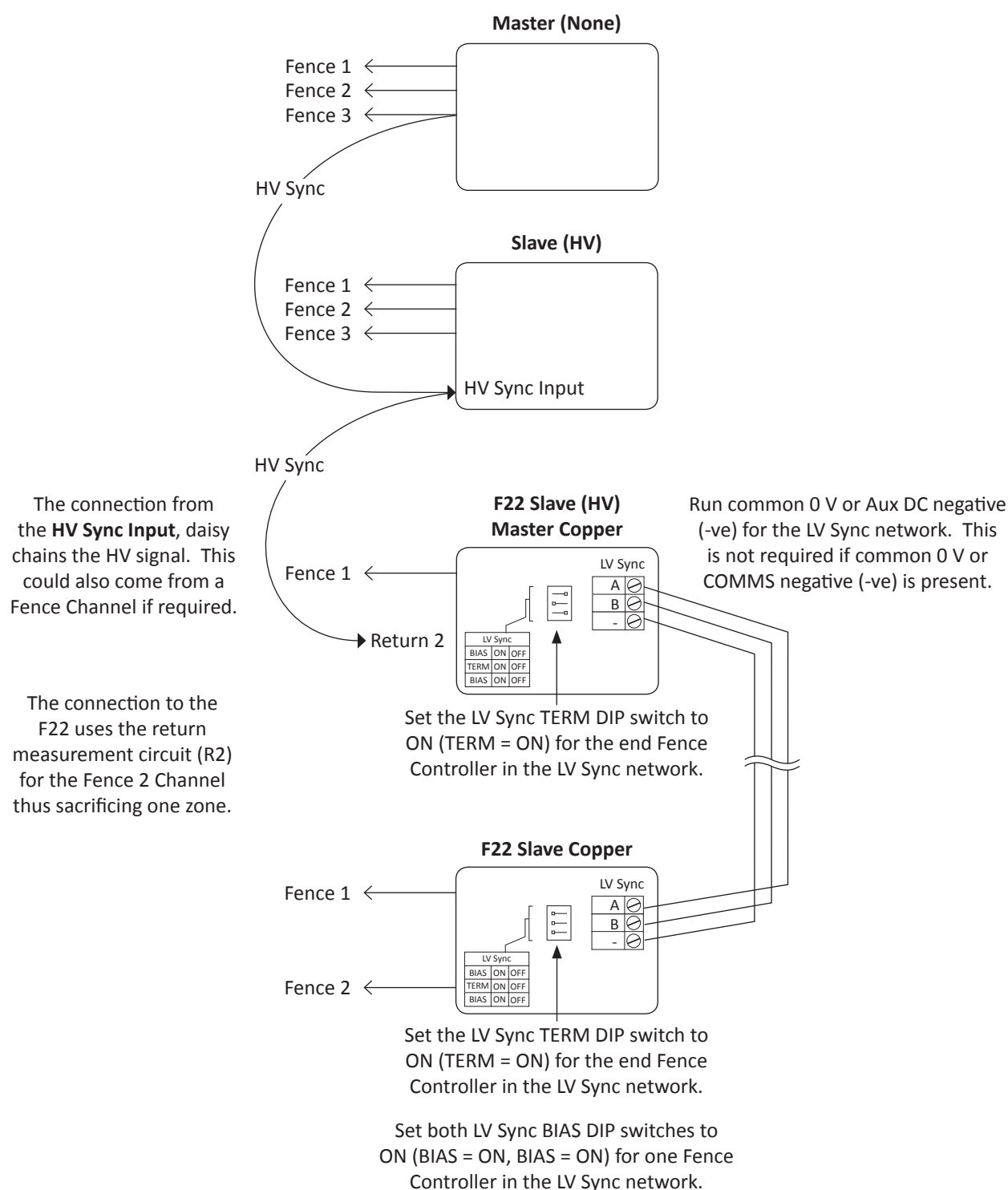
- Use CAT 5e 4 twisted pair 24 AWG (0.2 mm²) cable for the LV Sync network.
- The LV Sync network length should not exceed 1.2 km (3937 ft).
- Terminate the end Fence Controllers in the LV Sync network.
- Bias only one Fence Controller in the LV Sync network.
- If the master Fence Controller loses all power, all slave Fence Controllers will lose pulse synchronisation and pulse un-synchronised with the shortest delay possible.

HV Synchronisation

The master Fence Controller will provide a high voltage synchronisation signal (via the HV Sync Input) to the other Fence Controllers. The acceptable HV input range for the F22 Fence Controller to synchronise from is between 1.6 kV to 9 kV.

If an F22 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).

This configuration should be used when adding a new section of fence to an existing installation. The existing Fence Controller acts as a master allowing F22 Fence Controllers to be added.



Power and Battery Management

Battery selection

The Gallagher F22 Fence Controller is designed to accept a 12 V 7 Ah valve regulated lead acid battery.

The internal battery dimensions are:

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

Battery operation

A battery at 25 °C (77 °F) in good condition and fully charged will power the Gallagher F22 Fence Controller for approximately 13 hours (typical when using a standard installation and default settings).

Battery protection: (Go Slow mode)

The Gallagher F22 Fence Controller will enter Go Slow mode (skip every alternate pulse) when:

- the AC mains power has failed for a period of time greater than or equal to 30 minutes (default value), or
- the battery voltage is less than or equal to 11.5 V (default value).

These values are configurable in Command Centre.

Battery protection: (Stop mode)

The Gallagher F22 Fence Controller will enter Stop mode (cease producing pulses) when the battery voltage is less than or equal to 11 V (default value). This value is configurable in Command Centre.

Battery charging

The Gallagher F22 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.

Battery and temperature

The ambient temperature surrounding the battery is approximately 10 °C (18 °F) 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).

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.

Temperature

The Gallagher F22 Fence Controller is equipped with an on-board temperature sensor. This sensor measures the temperature within the Fence Controller unit.

The Gallagher F22 Fence Controller ambient temperature operating range (measured within the Fence Controller unit) without loss of performance is -20 to +50 °C (-4 to +122 °F).

The following table details how the Gallagher F22 Fence Controller responds to ambient temperature increases:


F22 Measured Temperature	Approximate Ambient Temperature	Comment
40 °C (104 °F)	20 °C (68 °F)	Optimal temperature.
60 °C (140 °F)	40 °C (104 °F)	High temperature status default value. This status is available in Command Centre. This temperature threshold is configurable in Command Centre and can be used to trigger a relay to activate a fan or other cooling method. Refer to the topic <i>"Configuring an F22 Fence Controller"</i> in the Command Centre Help.
75 °C (167 °F)	55 °C (131 °F)	Very high temperature status value. An alarm is generated in Command Centre. The energizer will skip every alternate pulse (Go Slow mode).
85 °C (185 °F)	65 °C (149 °F)	Critical temperature status value. An alarm is generated in Command Centre. The energizer will stop pulsing (Stop mode).

The following conditions apply to the above table:

- Both Fence Channels are functioning at maximum output with a pulse period of 1 second.
- The internal battery is being charged at the maximum current.
- The power supply is fitted within the Gallagher F22 Fence Controller unit.

LED Diagnostic Indications

Power status

LED Location	LED Status	Diagnostic Indication	Cover Icon
DS100 PWR	On (Green)	AC power is present	
DS101 BATT	On (Red)	Running on battery	
DS101 BATT	1 Flash (Red)	Battery low	
DS101 BATT	Fast Flash (Red)	Battery not present	

LED Location	LED Status	Diagnostic Indication
DS400 R1ON	On (Red)	Power is applied to coil of K400 – RELAY 1
DS401 R2ON	On (Red)	Power is applied to coil of K401 – RELAY 2
DS402 PROL	On (Red)	When overcurrent protection operates to limit the current taken from the internal 15V rail via the relay contacts when the relay contacts are supplied from the internal 15V rail
DS403 R1OL	On (Red)	When overcurrent protection operates to protect contacts of relay K400 – RELAY 1
DS404 CoOL	On (Red)	When overcurrent protection operates to limit the current taken from the internal 15V rail via the COMMS connector J405 + terminal P21
DS405 R2OL	On (Red)	When overcurrent protection operates to protect contacts of relay K401 – RELAY 2
DS500 PWR	On (Red)	When voltage is present on the internal 15V rail
DS501 BTEST	On (Red)	When testing of the battery is in progress

Connection status

LED Location	LED Status	Diagnostic Indication
DS102	1 Flash (Red)	Fully configured and functioning normally
DS102	2 Flash (Red)	Communications with the Controller, but the Fence Controller is not configured
DS102	3 Flash (Red)	No communications with the Controller

System Fault Finding

Introduction

The purpose of this section is to provide the field technician with a means of isolating the nature and approximate location of a fault within the security system. The faulty part can then be replaced and returned to the Gallagher service centre for repair.

A hit-and-miss approach to problem solving can be very frustrating and very expensive. It is better if the technician takes a systematic approach based on an understanding of the system, and how it fits together. In general two techniques should be used in problem-solving - isolation and substitution.

Isolation - establishing stage-by-stage which parts are working correctly and which are not, and so isolate the cause of the problem.

For example, if the problem is with a particular zone then disconnect that zone's wiring and link it out with a short piece of wire. If this resolves the problem then the fence and/or leadout cable is at fault. If not then the problem lies with the Fence Controller.

Substitution - replace suspect parts with a spare which is known to be good. If there is little change in behaviour then the original part was probably working correctly.

ATTENTION: Use static precaution procedures when handling circuit boards - otherwise damage may occur.

General Fence Controller checks

- Is the "Power Supply" light on (check the Power LED visible on the cover)? If not, then check the figure 8 connector and the AC mains power source.
- Is the battery plugged in correctly?
(The connector must be plugged in the right way).
- Has all screw terminal wiring been connected correctly?
- Are all plugs pressed firmly into their sockets?
- Is the system configuration correct?
- Are there any obvious signs of component damage on the energizer board?

General fault location

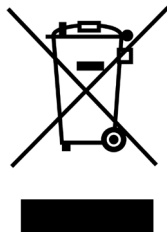
- Disconnect the fence lead-outs from the Fence Controller, and connect the appropriate fence and return terminals together with short wires. If the fault disappears then the problem is with the fence.
- Disconnect the earth lead-out from the Fence Controller. If the fault disappears then the problem is with the earth wiring.
- Disconnect all devices from the network and add each back in, one at a time, until the system fails. The last device added is the likely problem.

- Check the on-board 5 A fuses (F500 and F501). To replace a fuse, disconnect the AC mains power supply and the battery. Remove the fuse cover and replace the fuse with a 125 V AC or 230 V AC, 5 A, 5 mm diameter, 20 mm long fast acting fuse (Gallagher part number 2M1795).

Approvals and Standards

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.



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.

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: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



EN50130-4
EN55022



ACN 002 132 943



Lead Free

This product is compliant with the following safety standards when mounted vertically 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.

EN 60335.2.76:2005 + A12:2010
ASNZS 60335.2.76:2003 inc A1, A2
IEC 60335.2.76:2002 + A1:2006

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

Note: This time delayed electric fence energizer has a delay time of 16 seconds.

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Document Code: 3E2841
Edition 3, March 2013

Technical Specifications

Power supply:	110 V 60 Hz 240 V 50 Hz
Power consumption:	60 W maximum
Battery backup:	One 12 V 7 Ah valve regulated lead acid battery (not included)
Battery backup time:	13 hours (using default settings) with no current taken from the Aux. DC and DRY relay contacts selected
Aux. DC output (COMMS +):	11 - 14.5 V, 0.7 A (resetable fuse)
Fuse ratings (F500, F501):	5 A
EOL resistors (for inputs):	4.7 kΩ
Inputs per Fence Controller:	3
Outputs per Fence Controller:	2
Output switch capacity:	Refer to the "Relay Outputs" topic
Channels per Fence Controller:	2 (Fence 1 negative, Fence 2 positive)
High Voltage (per channel):	8 kV
Low Feel (per channel):	0.5 kV (with 500 Ω load)
Unit weight:	3.6 kg (8 lb) (includes packaging - excludes battery)
Dimensions:	380 mm x 255 mm x 111 mm (15" x 10" x 4 1/2")
Ambient temperature operating range without the loss of performance:	-20 to +50 °C (-4 to +122 °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
Maximum number of F22 Fence Controllers on one HBUS cable:	24

* Ambient temperature is the temperature of the air surrounding the Fence Controller unit.

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

PCB Overlay

