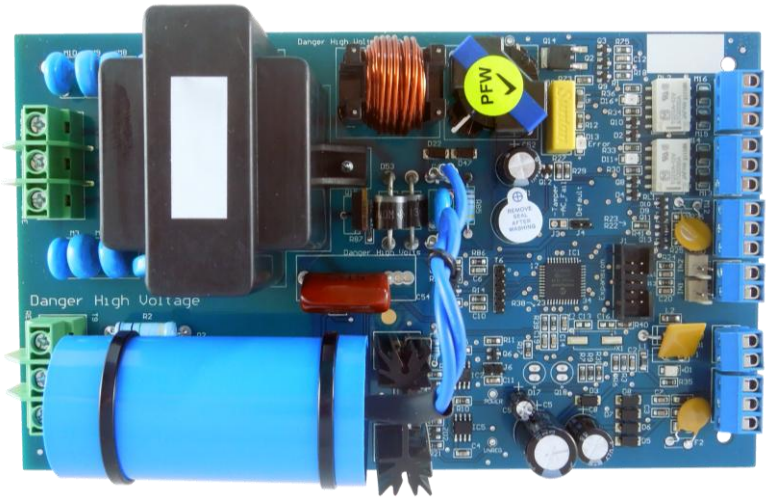
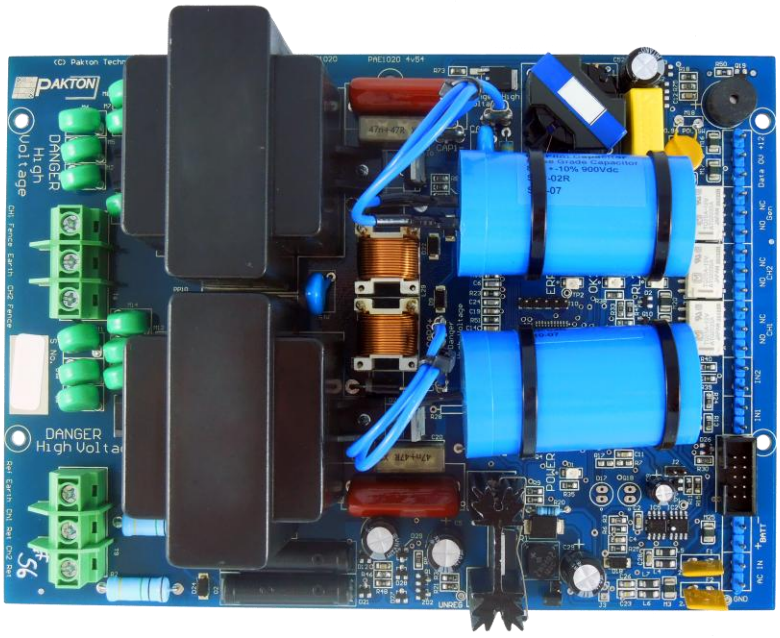
PAE101x Single Zone Bi-Polar Energiser PCBA



PAE102x Dual Zone Energiser PCBA



OEM Technical Manual

June 2014

Contents

1 Introduction

This manual is an OEM manual for the Single and Dual Zone security Energisers with Pakton product numbers PAE1015 and PAE1020 respectively.

The PAE1015 (16uF) is a Single Zone bi-polar 2.5 Joule (Output) security Energiser.
The PAE1015 (30uF) is the same as the PAE1015 (16uF), but with 3.6J output.
The PAE1020 is a Dual Zone 1.8 Joule (Output) security Energiser

This manual relates to
PCB versions: Single Zone 5v51 or higher and Dual Zone 4v51 or higher.
Firmware version: 7.61 or higher (the firmware version is shown on the LCD Display on reset)

1.1 Scope and Purpose.

- This document is intended for the training of engineering and technical personnel both internally at Pakton and for our OEM customers.
- As a reference for the features and specifications per version, as such it will be kept up to date and re-issued with each revision of the PCB or firmware.
- This is not intended as a “users” manual.

1.2 Part numbers

Pakton PCB assemblies for OEM customers have a PAE prefix, while complete Energisers in enclosures are have a PTE prefix.

1.3 Glossary

OEM	–	Original equipment manufacturer.
Zone	–	A high voltage fence output and return to provide perimeter security.
Control Input	–	An input that allows the user to control specific functions of the Energiser.
Relay Output	–	A programmable output (provided by a physical relay) to indicate an Energiser/Fence condition, such as Fence Alarm, Low Battery Voltage.
Bi-polar	–	A Bi-Polar fence is an all-live wire fence. A Bi-Polar Energiser has the ability to pulse synchronised positive and negative pulses down alternate wires of the same fence line.
Conventional	–	A Conventional electric fence is wired in such a way that alternate live and earth wires are on the fence.
Feed Voltage	–	(Also Fence Feed) The Voltage connection from the Energiser to the start of the fence zone.
Return Voltage	–	(Also Fence Return) The Voltage connection from the end of a fence zone to the monitoring circuit of the Energiser.
On/Armed	–	The Energiser is transmitting high (or low) voltage pulses onto the fence. The fence is secure.
Off/Disarmed	–	The fence zone is unsecure, but is safe to perform maintenance on.
Positive Voltage	–	The Positive fence voltage on a Bi-polar Fence.
Negative Voltage	–	The Negative fence voltage on a Bi-Polar Fence.
Low Power mode	–	The fence live wires operate at a much lower voltage, typically 500V peak. This ensures detection together with public safety.

2 Features

2.1 Power

2.1.1 PAE1015 (16uF) Power

- Powerful 4 joules stored energy
- Powered from safe low voltage (16Vac)
- Battery charger for rechargeable back up battery

2.1.2 PAE1015 (30uF) Power

- Powerful 7.7 joules stored energy
- Powered from safe low voltage (16Vac)
- Battery charger for rechargeable back up battery

2.1.3 PAE1020 Power

- Powerful 3 joules stored energy
- Powered from safe low voltage (16Vac)
- Battery charger for rechargeable back up battery

2.2 Control/Monitoring

2.2.1 PAE1015 Control/Monitoring

- 2 Control Inputs which can be configured to take NO (Normally Open) or NC (Normally Closed) control contacts
- 2 “Form C” contact relays with change-over contacts
- All relays may be assigned to any alarm function
- LCD voltage display (via optional display PCB)
- LED status lights
- On board alarm beeper
- AC fail, Low Battery and Bad Battery detection
- Keypad programmable options
- Low Power mode – ensures detection together with public safety during the day
- Energiser power output level
- Outputs may be wired for Bi-Polar or conventional wired fences (see section Example Wiring Diagrams)

2.2.2 PAE1020 Control/Monitoring

- 2 Control Inputs which can be configured to take NO or NC control contacts
- 3 “Form C” contact relays with change-over contacts
- All relays may be assigned to any alarm function
- LCD voltage display (via optional display PCB)
- LED status lights
- On board alarm beeper

- AC fail, Low Battery and Bad Battery detection
- Keypad programmable options
- Low power mode – ensures detection together with public safety during the day
- Energiser power output level

2.3 Safety

- Designed to pass IEC60335.2.76 and EMC standards

2.4 Reliability

- 1 Year Warranty
- Microprocessor controlled
- Pluggable screw terminals
- Inbuilt lightning protection, external fence lightning protection is still advised in high lightning prone areas
- Inputs protected against stray fence voltage

Note: it is advised that lightning diverters (PTE0050) be fitted to all high voltage inputs and outputs.

3 Specifications

3.1 Specifications Tables

3.1.1 PAE1015 SPECIFICATIONS TABLE

Table 1 – PAE1015 Specifications

Specification Name	Specification
Energiser Output Voltage	10KV (+5KV and -5KV) peak no load
Peak Output Energy	2.5 Joules (16uF), 3.6 Joules (30uF)
Pulse Rate	Crystal locked at 0.9 Hz
13.5V DC Power Consumption	5.0W (16uF), 9W (30uF)
AC Power Input	16-18 Vac 1A recommended
Battery Charger Output	Float voltage 13.8V, 300mA short circuit protected.
Relay Outputs	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac loads.
Control Inputs	Suitable for potential free (dry) contacts.
Size	119mm wide, 70mm high, 203mm long
Weight	779 grams

3.1.2 PAE1020 SPECIFICATIONS TABLE

Table 2 - PAE1020 Specifications

Specification Name	Specification
Energiser Output Voltage	8.5KV peak no load
Peak Output Energy	900mJ per Zone
Pulse Rate	Crystal locked at 0.9 Hz
12V DC Power Consumption	4.0W
AC Power Input	16-18 Vac 1A recommended
Battery Charger Output	Float voltage 13.8V, 350mA short circuit protected.
Relay Outputs	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac.
Control Inputs	**3.2 Suitable for potential free (dry) contacts or switched 5-12V. See section Low Voltage Terminals** .
Size	145mm wide, 70mm high, 205mm long
Weight	1320 grams

Notes:

- Specifications subject to change without notice.
- The firmware version is displayed on the LCD at power up (from both AC and battery off).

☠ DANGER ☠

- ***There are potentially lethal voltage inside the PAE1015 and PAE1020, refer to qualified service personal for repair.***
- ***The high voltage capacitors inside the PAE1015 and PAE1020 may take a long time to discharge.***
- ***Before working on the wiring of an electric fence it is recommended that the Energiser be turned off and an intentional short circuit is placed from the fence live wires to earth. This is a sensible precaution against the Energiser being turned on by others while you are working on the fence.***
- ***If an electric fence is part of a multiple Energiser system and the distance between two separate electric fences, each powered by separate Energisers, is less than 2.5 meters, the Energisers must be configured to operate in group mode.***

4 Description

4.1 Component Layouts (Top Side)

4.1.1 PAE1015 Component Layout (Top Side)

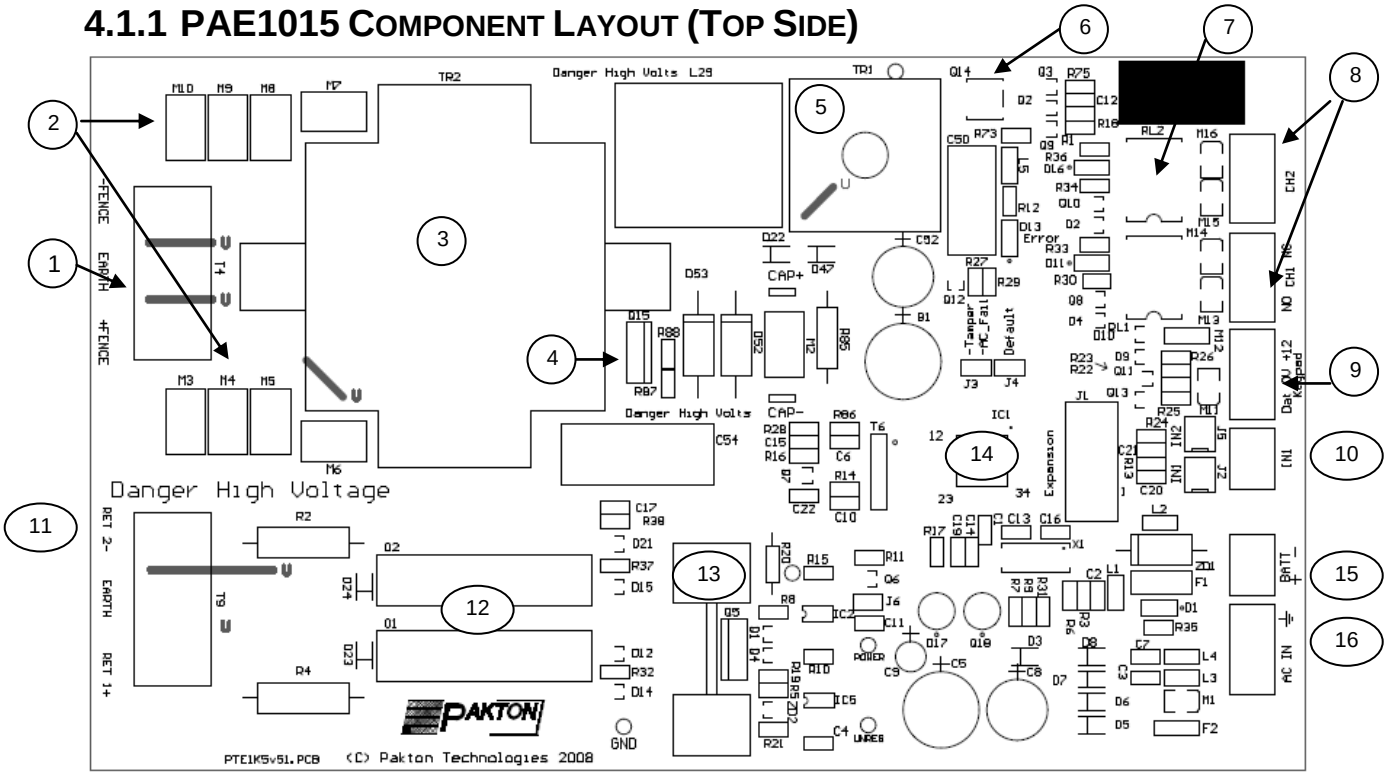


Figure 1 - PAE1015 Component Layout (Top Side)

Working from Top left across the PCB in Bands the main PCB items are.

1. Fence Feed Output terminal
2. Output Lightning protection MOV's
3. Output transformer
4. SCR
5. DC/DC charging transformer
6. DC/DC MOSFET
7. Alarm Relays
8. Relay terminals
9. Keypad Terminal
10. Control Input terminal and Sockets
11. Fence Return Input terminals
12. Main capacitor (sits above PCB)
13. Battery charger heatsink
14. Main processor (PIC)
15. Battery terminal
16. AC Power terminal

4.1.2 PAE1020 COMPONENT LAYOUT (TOP SIDE)

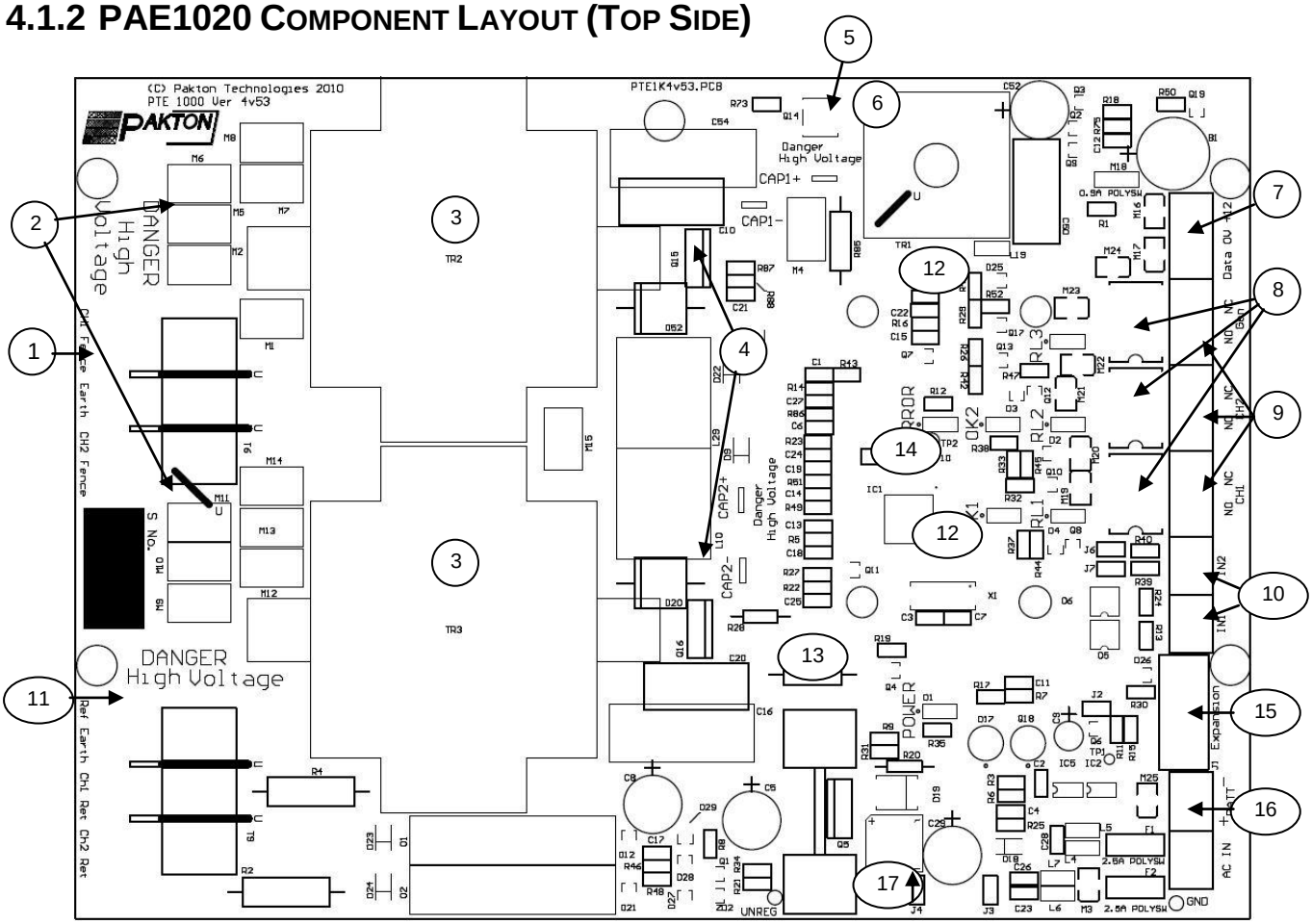


Figure 2 - PAE1020 Component Layout (Top Side)

Working from Top left across the PCB in Bands the main PCB items are.

1. Fence Feed Output terminal
2. Output Lightning protection MOV's
3. Output transformers
4. SCR
5. DC/DC MOSFET
6. DC/DC charging transformer
7. Keypad Terminal
8. Alarm Relays
9. Relay terminals
10. Control Input terminal and Sockets
11. Fence Return Input terminals
12. Main capacitors (both sit above PCB)
13. Battery charger heatsink
14. Main processor (PIC)
15. Battery terminal
16. AC Power terminal
17. J4: Return to default Jumper

4.2 LCD Voltage Display

Figure 3 - LCD Voltage Display

4.2.1 PAE1015 LCD Voltage Display

4.2.1.1Conventional mode

The display shows the voltage at the return terminals.

The left is the Return and the right does not show the fence voltage.

4.2.1.2Bi-Polar Mode

When configured for Bi-Polar operation the left side is the Positive Return Voltage and the right is the Negative Return Voltage.

4.2.1.3Programming Mode

The LCD also shows the programming option and current setting when in programming mode. This allows the programming options settings to be checked easily.

4.2.2 PAE1020 LCD Voltage Display

4.2.2.1Conventional mode

The display shows the voltage at the return terminals.

The left side of the LCD is the Return Voltage for Zone 1 and the right side of the LCD is the Return Voltage for Zone 2.

4.2.2.2Programming Mode

The LCD also shows the programming option and current setting when in programming mode. This allows the programming options settings to be checked easily.

4.2.3 LCD Voltage Display LED Lights

Power (D5)	-	On (GREEN) whenever the Energiser has power
Armed (D1)	-	On (RED) when a Zone from the Energiser is Armed
Fence (D2)	-	On (RED) when there is a fence alarm (either Zone).
Energiser (D3)	-	On (RED) when there is a Trouble with the Energiser e.g. AC Fail, Low Battery
Error (D4)	-	Flashes an error code (RED) for Energiser (service) errors. See section Error Codes.

4.3 Status LED Lights

4.3.1 PAE1015 STATUS LED LIGHTS

Power (D1) – On (GREEN) whenever the Energiser has power.

Error – Flashes an error code (RED) for Energiser (service) errors. See section Error Codes.

D11, D16 – Provides a visual indication of the output relays current status. Will be on (RED) if relay is in the alarm condition.

4.3.2 PAE1020 STATUS LED LIGHTS

Power (D1) – On (GREEN) whenever the Energiser has power.

Error – Flashes an error code (RED) for Energiser (service) errors. See section Error Codes.

RL1, RL2, RL3 – Provides a visual indication of the output relays current status. These will be on (RED) if relay is in the alarm condition.

OK1, OK2 – When Zone 1 and Zone 2 respectively of the security Energiser are OK (i.e. are armed and the voltages are above the FENCE ALARM VOLTAGE set points) these LED's fill flash (GREEN) when the high voltage output fires.

4.4 Keypad (Optional)

Figure 4 – 238 (left) and 236 (right) Keypads

A keypad can be used to remotely monitor and control the PAE1015 and PAE1020. It is also used to program the programmable options, see section Programming Options in Detail.
The PAE1015 and PAE1020 Support two keypad types the 236LED and the 238LCD.

4.4.1 THE 236 LED KEYPAD

To provide feedback to the user the 236LED keypad utilizes LEDs instead of a LCD display. A description of each LEDs function can be found below.

Power – On with AC power, flashes on low battery, Off when there is a Mains Fail.
Service – On with any Energiser fault (like low battery).
Arm – On when the Energiser is armed (pulsing), flashes when in low power mode.

For a group of Energisers, a Zone alarm will indicate a corresponding fence fault.
For one Energiser configured as stand alone, Zone alarms will be as follows:

Zone 1 – On when there is a fence fault (Zone 1, or positive wires for Bi-Polar).
Zone 2 – On when there is a fence fault (Zone 2, or negative wires for Bi-Polar mode).
Zone 3 – On when the gate 1 input is open.
Zones 4, 5, 6 – Not used.

NOTE: There is no panic function currently implemented.

4.4.2 THE 238 LCD KEYPAD

To provide feedback to the user the 238LCD keypad utilizes two LEDs and a LCD display. A description of each LEDs function and the messages that may appear on the LCD display can be found below.

Power – On with Mains power, flashes on low battery, Off when there is a Mains Fail.
Arm – On when the Energiser is armed (pulsing), flashes when in low power mode.

All other indication is given via messages on the screen.
Whenever the keypad displays:

- ALARM ZONE: - Press # to see the zone affected

For a group of Energisers, a Zone alarm will indicate a corresponding fence fault.
For one Energiser configured as stand alone, Zone alarms will be as follows:

Zone 1 – Displayed when there is a fence fault (positive wires for Bi-Polar).
Zone 2 – Displayed when there is a fence fault negative wires (Bi-Polar mode only), or Zone 2 on PAE1020.
Zone 3 – Displayed when gate 1 input is open.
Zone 4 – Not used.

- FAULTED ZONE
- Or SYSTEM TROUBLE

Pressing the # key will reveal more information, such as the name of the zone or the actual system trouble, like AC Fail.

For more information on using the 238LCD keypad please see LCD Keypad Operation.

4.5 Internal Beeper/Keypad Beeper

Depending on the CHIME MODE setting, the internal beeper and keypad beeper will sound when there is a fence alarm, a gate alarm or a general alarm or a door chime. On flat battery the keypad will always beep 4 times before the Energiser automatically enters low voltage mode to preserve the battery. On AC Fail it will not beep.

4.6 Cabling

High voltage cabling (Fence Feed and Returns) should be run using suitably rated cable. Double insulated electric fence “underground” cable is suitable. High Voltage Cables must never be run within the same conduit as Low Voltage Cables. A minimum distance of 30mm should be kept between High Voltage and Low Voltages Cables.

To maintain the IPx4 rating of the enclosure and to ensure moisture does not enter the enclosure via the cable entry area a silicon sealant (neutral cure) must be used to seal all the cable passages.

4.7 Lightning Protection

Although the PAE1015 and PAE1020 contain internal lightning protection elements, external lightning protection elements such as additional external lightning kits available from your local dealer, are recommended as they would help to reduce lightning damage even further.

4.8 Monitor Earth

The PAE1015 and PAE1020 have two fence earth terminals, in most installations these may be joined and only one wire used to connect to the earth. Directions on how to wire for earth loop monitoring are in section Example Wiring Diagrams.

4.9 Noise and Interference

The PAE1015 and PAE1020 contain a microprocessor. Extreme electrical noise can upset microprocessors. The most likely cause of such noise is the high voltage output from the Energiser itself. In the event of erratic behaviour, check that the high voltage wiring is firmly connected to the terminals and that no sparking is seen. The PAE1015 and PAE1020 are designed to self-recover from interference, powering off (both AC and battery) should not be necessary.

4.10 Programmable Options

Both the PAE1015 and PAE1020 have many programmable options. These are also known as SETUP PARAMETERS. To alter these options a keypad must be used. The options are explained in section Programming Options in Detail. Each parameter has a factory set default.

4.11 Low Power Mode

PAE1015 and PAE1020 Energisers can be switched into Low Power mode. Low Power mode may be used in situations where the fence is not required to be a deterrent but is still required to actively detect intrusion. In Low Power mode the fence live wires operate at a much lower voltage, typically 500V peak. See section Programming Options in Detail for details on using the keypad to set low voltage mode.

4.12 Control Inputs

Inputs 1 and 2 default to On/Off (Arm/Disarm) Control and Low/High Power control from normally open contacts. Input 2 can also be configured as a “gate” input.

The “gate” input may be wired to a gate switch to trigger an alarm when a gate is opened.

4.13 Groups

The PAE1015 and PAE1020 may be linked to form a “group” to power multiple zones. See appendix A.

4.14 Models

4.14.1 THE PAE1015

The PAE1015 is a Single Zone security Energiser. The PAE101x is capable of conventional or Bi-polar operation. In Bi-polar operation the PAE101x display both the positive and negative voltages on the LCD. The 2 inputs default to On/Off and High/Low power mode.

4.14.2 THE PAE1020

The PAE1020 is a Dual Zone Conventional security Energiser. It has two independent fence outputs so it is equivalent to having two Energisers in one enclosure. Each Zone has a high voltage output and a monitor return input. Control Input 1 defaults to On/Off, see Input 2 Function (12x#) for Input 2 defaults.

5 Installation

5.1 Installation Steps

The following steps are general steps which should be followed when installing a security Energiser. Note that the instructions below will change depending on the type of enclosure the Energiser is mounted in.

1. Read the entire manual first!
2. Design and build the fence. (Beyond the scope of this manual.) Ask your distributor for help if required.
3. Decide where the security Energiser is to be mounted. If on an external wall it should be housed within an equipment box and definitely not in direct sunlight.
4. Remove the PCB chassis from the housing enclosure
5. Mount the enclosure by using 4 screws through the rear of the enclosure.
6. Replace the PCB chassis.
7. If using a keypad, remove the rear housing of the keypad and fix it to the wall.
8. Wire the low voltage cables to the PCB terminals.
9. Wire the high voltage cable to the PCB terminals.
10. Seal the cable entry area with neutral cure silicon sealant RTV.
11. Fit the battery leads to the battery. The Error LED should be blinking twice to show mains fail.
12. Warning: If the input switch is set to the armed state then the Energiser will start running when power is connected.
13. Replace the front cover.
14. Turn AC power on.
15. Arm and disarm the Energiser via the control input or keypad if fitted. The Error LED should stop blinking.
16. Arm the Energiser. The LCD display will now show the fence voltage.
17. Check to ensure that a short anywhere on the fence triggers the alarm.

5.2 Example Wiring Diagrams

5.2.1 PAE1015 Example Wiring Diagrams

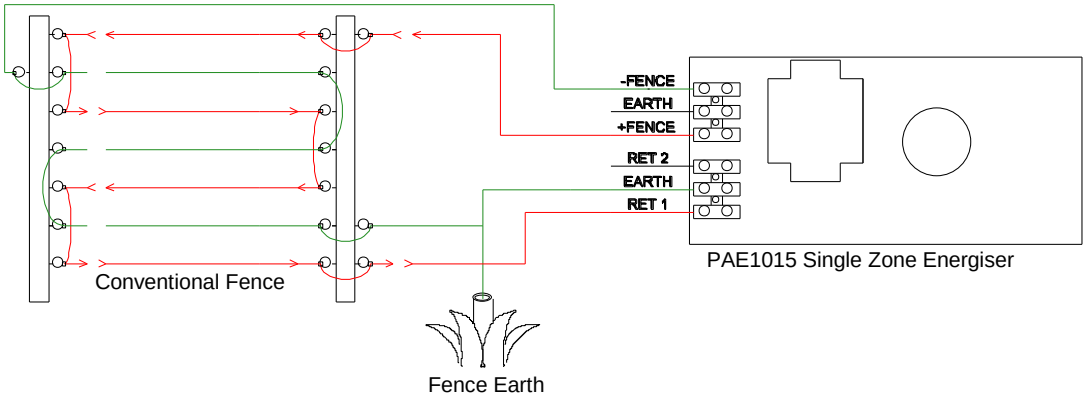


Figure 5 - PAE1015 Single Zone Energiser configured for conventional fence operation

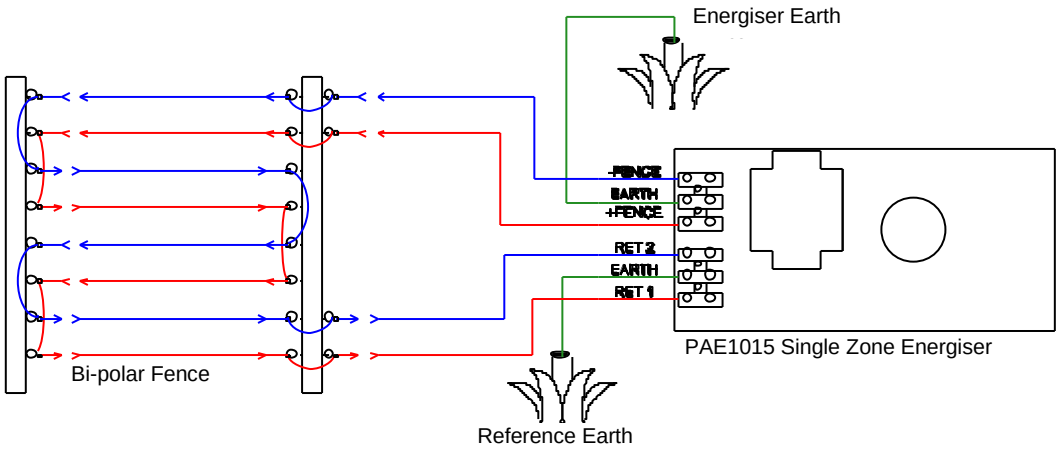


Figure 6 - PAE1015 Single Zone Energiser configured for Bi-Polar fence operation

5.2.2 PAE1020 EXAMPLE WIRING DIAGRAMS

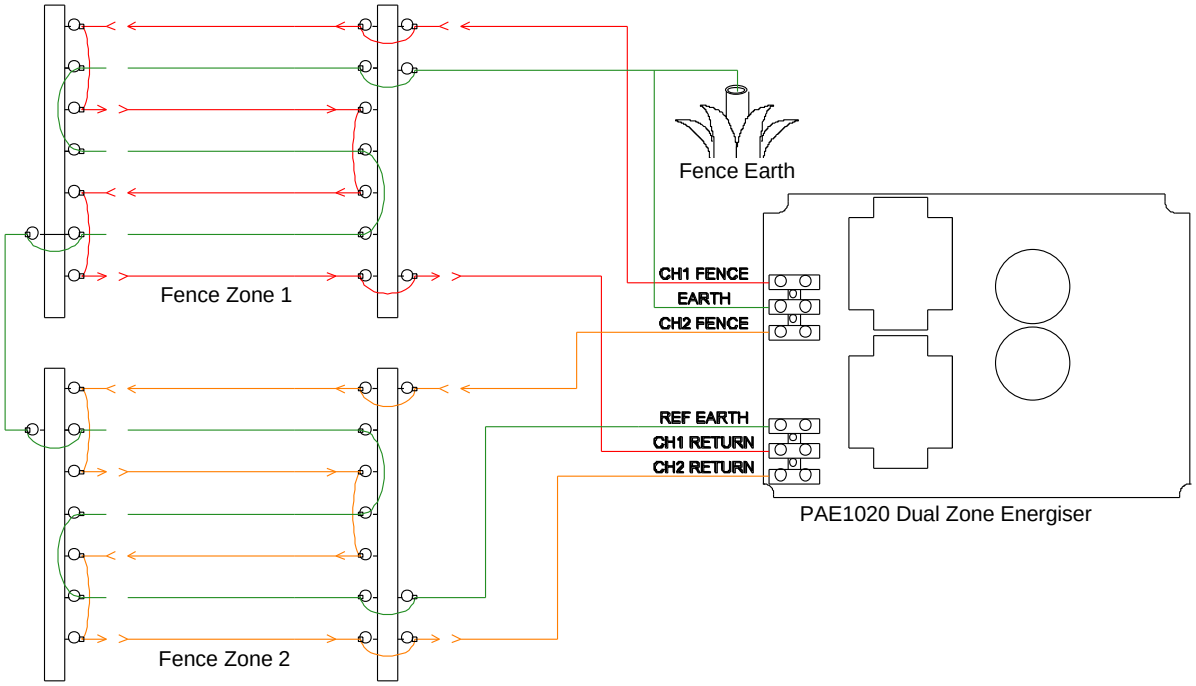


Figure 7 - PAE1020 Dual Zone Energiser showing two zones in operation

Below are two example “Energiser to Fence to Earth” wiring diagrams that include the PTE0050 Lightning Diverters. The first example shows the Lightning Diverters fitted at the Energiser, while the second shows them fitted at the fence.

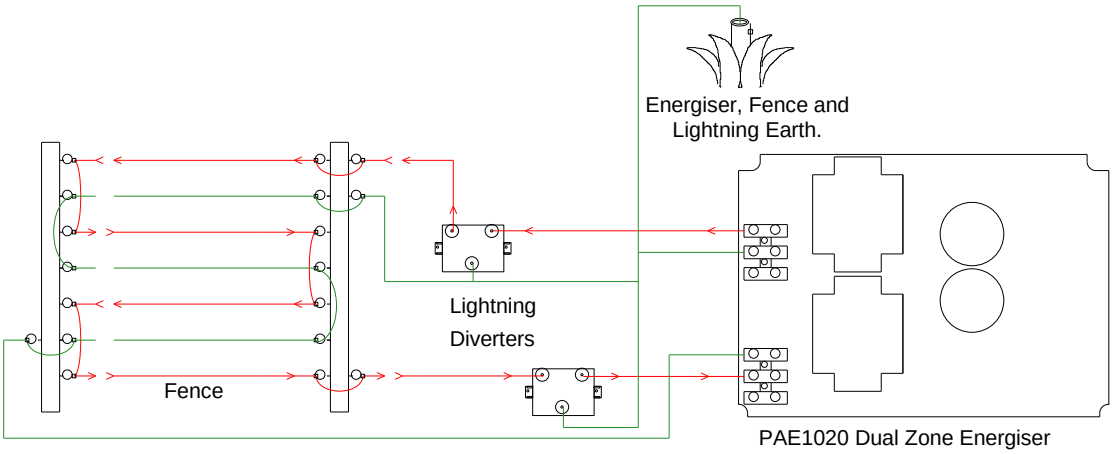


Figure 8 - Lightning Diverters fitted at the Energiser

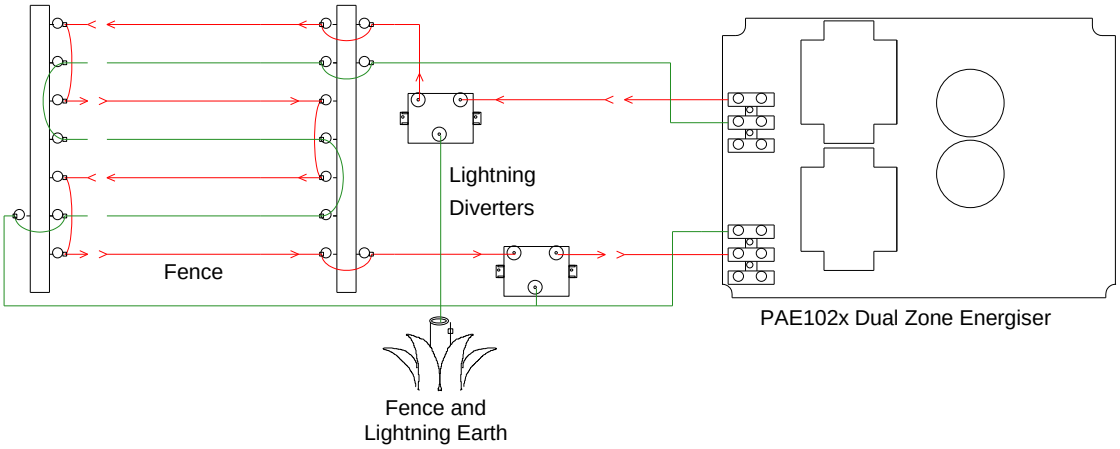


Figure 9 - Lightning Diverters fitted at the fence

6 Operation

6.1 Arm/Disarm Control

The PAE1015 and PAE1020 can be armed or disarmed by the Control Input 1 or via a keypad. The keypad also allows instant audiovisual indication of the state of the Energiser and therefore the fence it is powering.

If there are two ways to control the Energiser both connected at once, i.e. keypad and control inputs, then the last change will determine the result. I.e. if the Energiser is armed via the keypad and then disarmed at the control input it will disarm.

If in doubt ask your installer.

Arming one Fence Zone using the Keypad (PAE102x Only).

Enter your **User PIN** and press ***11#** to turn Zone 1 On but leave Zone 2 Off (if it was off).

Enter your **User PIN** and press ***12#** to turn Zone 2 On but leave Zone 1 Off (if it was off).

Note: Enter ***11#** to arm Zone 1, and ***21#** to disarm Zone 1.
Enter ***12#** to arm Zone 2, and ***22#** to disarm Zone 2.

6.2 Arming the Fence Using the Keypad

Enter your **User PIN** (Personal Identification Number: four digits long) and push the # key. Make sure the red ARM light comes on and the keypad will beep twice to confirm that the system is armed.

The fence will power up and if all is well (no faults) the system will be ready to deter and detect. If there is a fault on the fence and it cannot achieve full voltage, Zone 1 or Zone 2 LEDs will flash.

To disarm the system， enter your **User PIN** and press **#.** This will also clear any fault lights and zone lights which may have been on.

6.3 Turning to Low Power Mode

To switch to Low Power mode enter your **User PIN** and press ***41#.** In Low Power mode the fence will still be powered and any breach will be detected but the voltage will be much lower than normal operation. The ARM light will flash in Low Power mode.

Enter your **User PIN** and press ***42#** to switch back to Full Power mode

Alternatively, the Energiser can be switched to Low Power mode using Control Input 2 if it has been programmed accordingly.

6.4 When an Alarm Occurs

If the system is armed and the fence is tampered with, the corresponding zone light will flash and then remain on. Relays assigned to alarms will turn on. If the Energiser is connected to a building

alarm system for monitoring, an alarm signal may be sent to the alarm company monitoring the alarm system.

An alarm will also sound if Control Input 2 is assigned to the “gate” function and the Input is opened and the GATE ENTRY/EXIT DELAY time has elapsed.

After the siren has cycled on and off according to the times and numbers set in options, the siren will stop sounding. The Strobe will remain on. After a further delay (AUTO REARM TIME) the siren will again respond to the next alarm.

6.5 To Silence the Alarm

Enter your **User PIN** and press **#.** This will silence the alarm and also disarm the system.

The zone lights on the 238LED keypad will flash to show where the breach occurred.

The siren and strobe are ready to respond again if triggered.

Alternatively, disarming using the key switch will reset the alarm.

6.6 Changing Your User PIN

Enter the old 4 digit user PIN and press ***0#.** This enters User Programming mode.

Enter your new user PIN (must be 4 digits) and then **#**.

Press ***#** to exit user Programming mode.

Make sure your new PIN works by using it to arm the Energiser.
The default User PIN is 1234.

6.7 Standby Battery

Should there be a loss of mains power, the *Power* light on the keypad will go off. If the loss of power is prolonged, the battery may discharge power and become ineffective. The P*ower* light will start to flash indicating a battery low power problem.
If the standby battery requires replacement, the *Power* LED will flash and the *Service* light will be on.

6.8 Error (Service) Light

If the Energiser develops an internal fault, the *Error* light will come on. Call the installer for service.

7 LCD Keypad Operation

7.1 Keypad status LEDs

The LCD keypad has two LEDs, Power and Arm, which act as follows:

Power: On with Mains power, flashes on low battery.

Arm: On When the energiser is armed (pulsing), flashes when in Low Power Mode.

7.1.1 ARMING/DISARMING THE FENCE USING THE KEYPAD

Enter your User PIN (Personal Identification Number: four digits long) and push the # key. Make sure the red ARM light comes on and the keypad beeps twice to confirm that the system is armed.

The fence will power up and if all is well (no faults) the system will be ready to deter and detect.

To disarm the system, enter your User PIN and press #.

Note: If there is an alarm sounding you will need to enter your PIN twice, once to silence the alarm and once more to disarm.

7.1.2 MENUS

The LCD keypad has an optional menu driven interface. The main menu is accessed by pressing the Menu (Bypass) key (bottom right). You will be asked to enter your PIN, and then press #.

Most functions are available via the menus. Use the 2 key to go up and the 8 to step down through a menu. The Enter (#) key is used to select the current line.

The menu will time out after a few minutes and return to the normal status display.

The menu system was added in keypad code version 2.10

7.1.3 KEYPAD STATUS DISPLAY

In normal operation the keypad shows a continuous summary of the system status. For example if the system is disarmed the keypad will display “Ready to Arm”.

If the system is armed then the keypad will display the voltages for each zone in the system.

Since there can be many things to display the keypad automatically “scrolls” through all relevant detail. Each screen is show for about 2 seconds. If you wish to hold the display at a particular point simple press the [#] key. The auto scrolling will stop for about 20 seconds.

Pressing the [#] key again will advance the display one step.

If a new trouble (AC fail, low battery etc) or alarm occurs, the keypad screen will jump to the relevant zone, the keypad will beep (unless toggled off) and auto scrolling will cease for about 3 minutes.

7.1.4 CHANGING THE KEYPAD MESSAGES AND ADDRESS

You can change the messages and each of the zone labels.

- The Dealer Message displays when the system is on standby
- Zone Labels display after the [#] key is pressed during alarm memory or faults.
- The programmable Service Message is displayed during AC failure, fuse failure, communication failure, or low battery.

Keys used for changing messages:

[1]	[2] Character up	[3] not used	Emergency not used
[4] <- Cursor left	[5] Next Message	[6] -> Cursor right	Fire not used
[7]	[8] Character down	[9]	Panic not used
[*]	[0] Last Message	[#] Enter / Exit	Bypass not used

- To activate the keypad programming mode, enter the [Installer's Code] [*] [0] [1] [#]. Information may be entered into the keypad in the form of letters (upper and lower case), numbers (0 - 9), and 22 special symbols. All characters are displayed in the order: upper and lower case letters, numbers, and special symbols. The [Space] character precedes the letter A.
- To enter a Label, use the [2] key to scroll through the characters until you reach the desired character. If you scroll past the desired character, the [8] key may be used to scroll backwards. Note; the space character is before the A character (When A is displayed, press [8] to get a space).
- When the desired character is displayed, press the [6] key to move the cursor to the next character position. The [4] key moves the cursor to the left.
- When all characters have been entered, press the [#] key to enter the message and move to the next message position.
    - Use the [0] key to move backward through the messages.

NOTE: If you move to the next message using [5] instead of the [#] key you will lose any changes you made!

To change the keypad address, scroll through the messages until the keypad displays: “Keypad address __” then change the value by pressing [2] (up) or [8] (down). Validate by pressing [#].

The message order is:

- SERVICE MESSAGE (Displayed under “SYSTEM TROUBLE”)
- DEALER MESSAGE (Displayed under the standby message: “READY TO ARM”)
- SOFT ZONE IDENTIFIERS (A, B, and C) (not used)
- ZONE LABELS (Zone 1 = Fence, Zone3 = Gate)
- KEYPAD ADDRESS (should be set to 1)

7.2 Connecting Multiple Keypads to a system

Up to three keypads may be used to remotely monitor and control the PAE1015 and PAE1020 security energisers.

To operate correctly, each Keypad must be configured to use a unique KEYPAD ADDRESS. This is best achieved by connecting one keypad (at a time) to the Master Energiser and updating the KEYPAD ADDRESS. Once all Keypads have a different address, all can be connected to the system. A recommendation is that one Keypad is kept at ADDRESS 1.

The Energiser now needs to be introduced to all of these Keypads. This is achieved by resetting the Energiser using the Keypad (configured to ADDRESS 1), by pressing [USER PIN]*68#. Alternately the power can also be removed to reset the Energiser. After a reset, the Energiser will determine what Keypads are connected, and only these ADDRESSES will be used in the future. This prevents un-authorised Keypads being added to the system once it is running.

If the security system is to use a PC based interface such as Perimeter Patrol, KEYPAD ADDRESS 2 should not be used by a keypad. The PC software uses this address to control the Energisers.

7.3 To Exit Programming Mode

When you finish programming, press [*] [#] to exit.

Note: The keypad will also exit the programming mode if you do not press any key within a five minute period.

To return the Keypad to default settings press the  emergency button during power up. This feature was added in keypad firmware version 1.2.

7.4 Notes Regarding Keypad Configuration

Zone 1 (the master) must be connected to the group. If it is not connected the other energisers in the group will not send status packets to the keypad. The status packets contain voltage and alarm information which the keypad displays. If Zone 1 is not connected, the keypad will report a communications failure with all the zones.

A Slave Energiser disconnected from the Group will only talk to a Keypad if it has a KEYPAD ADDRESS of 1. When add/remove an energiser to/from the group, be sure to re-analyse the group using the key sequence *68#. Zone 1 (the master) must be connected to the group for this operation to work.

When re-analysing a group ensure all energisers are disarmed. If they are not, this function will not work properly.

Note: If the group ID has recently been changed you may need to reset ([PIN]*68#) before the new ID's will be properly reported to the keypad.

7.5 Calibrating the Voltage Display

The PCB's will be factory calibrated and should not require adjustment for the life of the product. If, however, certain components are replaced during repair the Energiser may need recalibration. This includes the main processor chip.

7.5.1 PROCEDURE:

1. Connect positive, negative and earth returns as shown in the picture below.

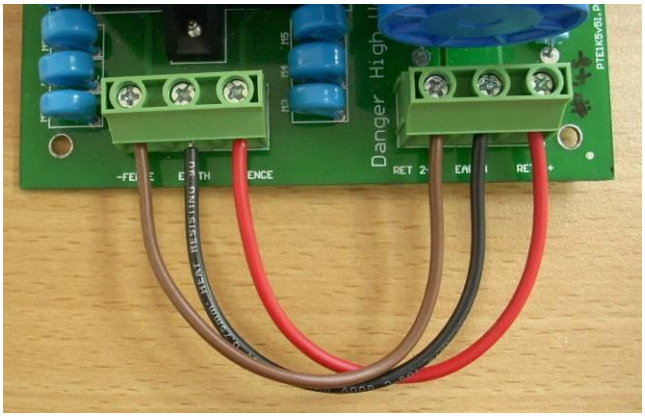


Figure 10 - PAE1015 feedback wiring

2. Plug in the keypad and connect either AC power or a battery to the Energiser.

7.5.2 CLEARING OLD CALIBRATION USING THE KEYPAD:

3. Type [Installer's Code] [*] [0] [#] Enter programming mode
4. Type [9][8][0][0]# Clear the calibration for the Left Value
5. Type [9][9][0][0]# Clear the calibration for the Right Value
6. Type [*] [#]. Exit programming mode
7. Once the calibration is cleared, run the Energiser and record the actual positive and negative return voltages, and those displayed on the LCD. The actual voltages must be higher than the displayed voltages for calibration to work.

Left Value

PAE1015 (Bi-polar) Positive Return

PAE1015 (Conventional) Return

PAE1020

Zone 1 Return

Right Value

PAE1015 (Bi-polar) Negative Return

PAE1015 (Conventional) Does not show the Feed voltage.

PAE1020

Zone 2 Return

Figure 11 – Example Voltage Readings

8. Calculate the return calibration factor = (Actual Voltage / Displayed voltage *100) – 100

   For example If after clearing the calibration the Actual fence voltage is 7.1 but the display reads 4.6 (as per the picture above) the factor is:

   7.1 / 4.6= 1.543

   *1.543 *100 = 154.3*

   154.3 - 100 = 54.3 round up to 55

   For the Negative Return voltage, the factor to enter is 55 (an increase of 55 percent). Repeat these steps for the Positive Return voltage calibration. Note that the Positive and Negative return voltages displayed before calibration will likely be different.

7.5.3 ENTERING NEW CALIBRATIONS USING THE KEYPAD (FOR OUR EXAMPLE)

9.	Type [Installer's Code] [*] [0] [#]	Enter programming mode
10.	Type [9][8][5][5][#]	Enter the calibration for the Left Value
11.	Type [9][9][5][8][#]	Enter the calibration for the Right Value
12.	Type [*] [#].	Exit programming mode

7.6 Summary of LCD Keypad Functions

Function	Key Sequence
Arm/Disarm	[User PIN][#]
Silence an alarm (Single zone system only)	[User PIN][#]
Start Programming the Z series energiser	[Installer PIN][*] [0] [#]
Start Programming the Keypad	[Installer PIN][*] [0] [1] [#]
Exit Programming (any mode)	[*] [#]
Change a User PIN, 4 Digits	[User PIN][*]0[#][New PIN]#
Change the Installer PIN, 5 Digits	[0] [0] [New Installer PIN][#] Note 1
Arm All Zones (Multi-zone groups)	[User PIN][*][1][0][#] Note 2
Arm Zone 1 (Master)	[User PIN][*][1][1][#]
Arm Zone x, where x is any zone number up to 15	[User PIN][*][1][x][#]
Disarm All Zones	[User PIN][*][2][0][#]
Disarm Zone 1 or Master	[User PIN][*][2][1][#]
Disarm Zone x, where x is any zone number up to 15	[User PIN][*][2][x][#]
Switch to low power mode (all zones)	[User PIN][*][4][1][#]
Switch to high power mode (all zones)	[User PIN][*][4][2][#]
Arm Gate circuits only	[User PIN][*][4][#] Note 6
To change the Keypad Messages to English	[*][3][1][#]
To change the Keypad Messages to Spanish	[*][3][2][#] (not well supported yet)
Keypad Audible Feedback On/Off	[*] [5] [1] [#]
Keypad Chimes On/Off	[*] [5] [3] [#]
Keypad Error Tones On/Off	[*] [5] [4] [#]
Local Keypad Alarms On/Off	[*] [5] [5] [#] Note 7
Backlight mode On/On with keys/Off	[*] [8] [#]
Display Keypad Model	[*] [9] [#]
Re-analyse the group	[*][6][8][#]
Reset and Display firmware version number	[User PIN][*][6][8][#] Note 3
Reset and return to factory defaults	[Installer PIN][*] [6] [8] [#] Note 5
Power Boost	[*] [9] [9] [#] Note 3
Siren test	[*] [6] [3] [#] Note 3
Battery test	[*] [6] [4] [#] Note 3
Clear Alarm memory	[*] [1] [#] Note 4

Notes:

1. Operates while in programming mode only.
2. The group arm and disarm codes were added in version 7.5 of the firmware.
3. Added in firmware version 7.69 , Battery test will only operate while the Energisers is disarmed.
4. Added in firmware version 7.77
5. Added version 7.86
6. Added version 7.89
7. Added in Keypad Version 2.00

7.7 PTE0210 – LCD Keypad

7.7.1 INTRODUCTION

The PTE0210 keypad is intended to replace the 238LCD keypad previously used for Pakton security energisers. The PTE0210 uses the same case and LCD display as the 238LCD keypad however it houses a revised circuit board design and new code.

7.7.2 EXISTING FEATURES

When developing the PTE0210 one of the design goals was to produce a keypad which a user already familiar with the 238LCD keypad could perform all the basic functions without having to read the user manual. The local menu, LED error codes and key sequences were kept the same so as to achieve this; however the way in which GROUP MODE information is displayed has changed.

7.7.3 NEW FEATURES

The PTE0210 is able to track what energisers are connected in a group. This allows it to inform the user if there is a communications failure with any one of the energisers. When configuring a new group of energisers, the user will need to tell the keypad to look for new energisers in the group. In order to analyse a new group use the key sequence *68#. This does not need to be done every time the keypad is connected to the group. The keypad will remember which energisers are connected to the group.

More detailed information is now displayed about each zone. In the past basic alarm and trouble information has only been displayed for zones 1 to 8. The PTE0210 is able to display detailed alarm, trouble and status information for zones 1 to 14. It will prioritise alerts so that the most urgent alerts are displayed automatically when the user stops interacting with the keypad. Alert priorities can be switched by pressing the bypass button (bottom right of keypad). Note that after 10 seconds the display will time out and return to displaying the highest priority alarms once again. When running in auto display mode the keypad will update the display with new information once every second. To scroll quickly to another zone press the hash key repeatedly until the zone you wish to see is displayed. Note that after 10 seconds the display will time out and return to updating once every second.

Alert Level	Low	Medium	High
General Description	Status	Trouble	Alarm
Information	Armed (Feed and Return Voltages Displayed)	AC Fail	Communications Failure
	Disarmed	Flat Battery	Zone 1 Alarm
		Bad Battery	Zone 2 Alarm
			Energiser Fault
			Gate 1 Alarm (requires protocol change)

The keypad is now able to detect and display an alarm when communications between it and a specific zone fails. In order to trigger a communications failure alarm for a specific zone, the zone needs to be disconnected from the group for 5 seconds or longer.

The backlight now has three modes which are switched between using the [*][8][#] key sequence. The three modes are:

1. Always Off
2. Timeout Mode
3. Always On

In timeout mode the backlight will turn on if a new alarm or trouble condition is received or if a button is pressed and turn off 20 seconds after the alarm/trouble condition is received or 20 seconds after a key has been pressed.

7.7.4 NOTES REGARDING CONFIGURATION

There things to remember when configuring/using the keypad.

- Zone 1 must be connected to the group. If it is not connected， the other energisers in the group will not send status packets to the keypad. The status packets contain voltage and alarm information which the keypad displays. If Zone 1 is not connected, the keypad will report a communications failure with all the zones.
- If the keypad is unresponsive, this is likely due to the energiser going looking for other keypads in the group. Be patient. Wait a few seconds and try again.
- When adding/removing an energiser to/from the group, be sure to re-analyse the group using the key sequence *68#. Zone 1 must be connected to the group for this operation to work.
- When re-analysing a group ensure all energisers are disarmed. If they are not this function may not work properly.
- In 1v09 of the keypad code and 7v83 of the energiser code, the ability to detect energisers in bi-polar mode and two Zone energisers was added. This allows the keypad to correctly display zones and voltages.

8 Technical information (Technicians section)

8.1 Low Voltage Terminals

8.1.1 PAE1015 Low Voltage Terminals

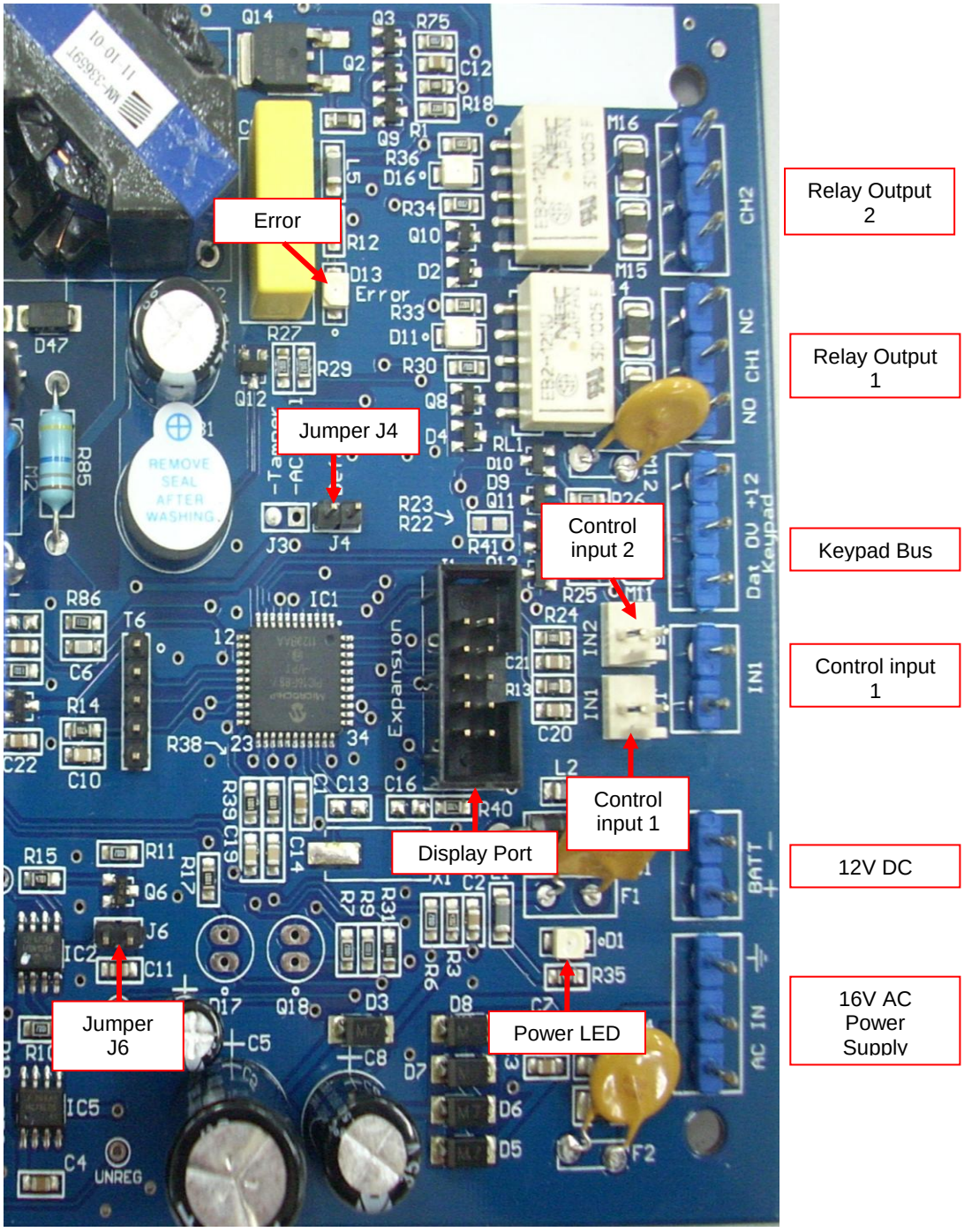


Figure 12 - PAE1015 Low Voltage Terminals

Table 3 - PAE1015 Low Voltage Terminals Description

Label	Type	Description
IN1	2 Way	Energiser Control Input, dry contact (Terminal block and Molex connector). This Input will arm and disarm the Energiser
IN2	2 Way	Energiser Control Input, dry contact (Molex connector). By default this input will switch the Energiser between high and low power modes. It can also be used as a "gate" input if option 12 is set to 0 (See programming options).
Keypad	3 Way	Supplies power and data line for an external keypad. The +12 source on the terminals is protected with a 1A self resetting fuse.
Output Relay 1	3 Way	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac. By default this output will activate when the Energiser is Armed AND the fence voltages on either Bi-polar return line has fallen below the programmed FENCE ALARM VOLTAGE for more pulses than the MISSED PULSE COUNT. Not latched.
Output Relay 2	3 Way	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac. By default this output will activate when there is an Ac fail OR Low battery OR internal error. Latched for internal errors only.
AC IN	3 Way	16Vac power input. Fused via F2 1A self resetting fuse.
BATT (Battery)	2 Way	12V dc or battery connection via F1 (3 Amp self resetting fuse). Red lead to battery positive (+) terminal.
Expansion (Display Port)	10 Way	The display port allows a LCD display to be connected to the Energiser to display feedback voltages and status lights. A picture of the LCD display can be found in LCD Voltage Display.

8.1.2 PAE1020 LOW VOLTAGE TERMINALS

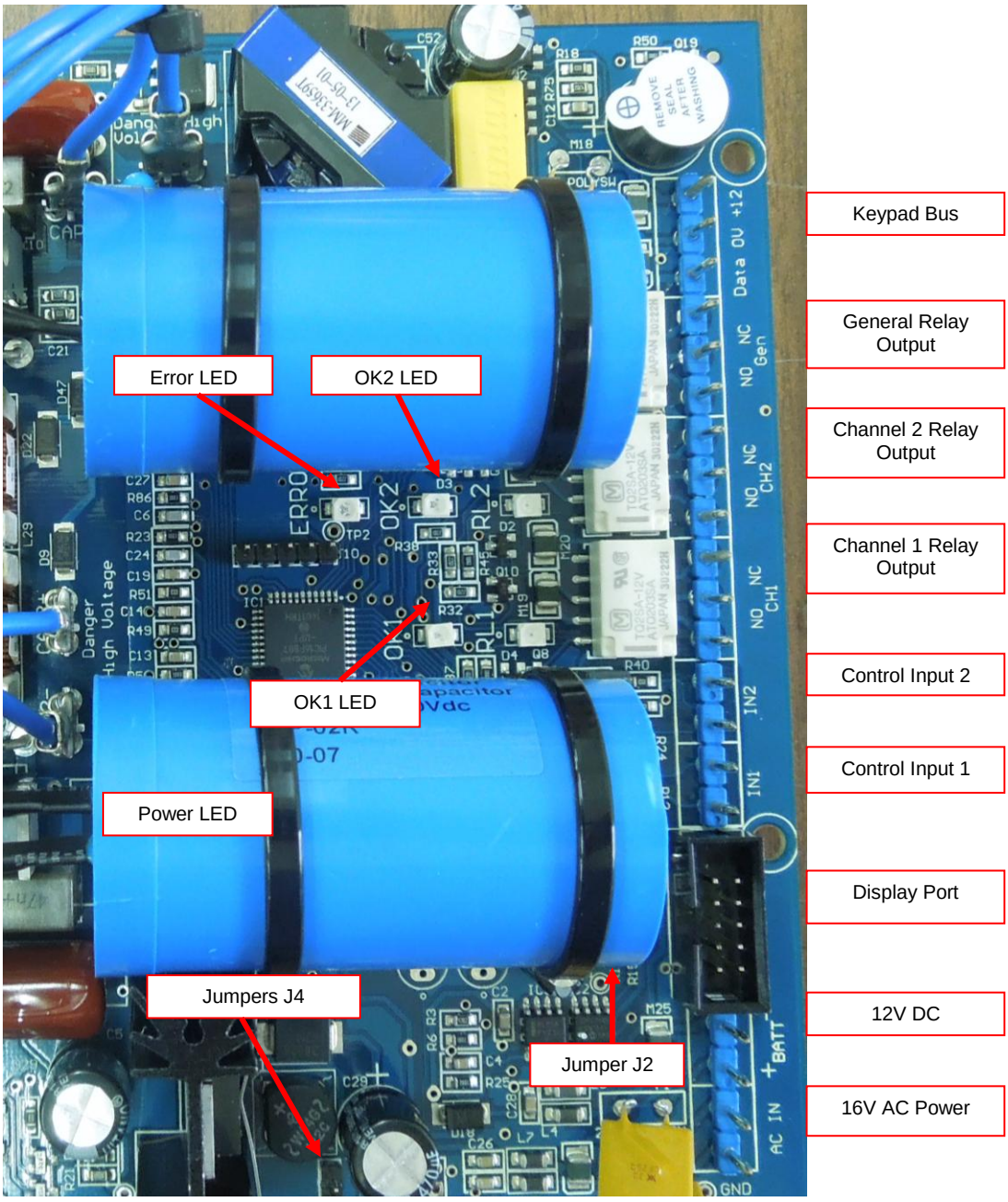


Figure 13 - PAE1020 Low Voltage Terminals

Table 4 - PAE1020 Low Voltage Terminals Description

Label	Type	Description
AC IN	3 Way	16Vac power input. Fused via F2 1A self resetting fuse.
BATT (Battery)	2 Way	12V dc or battery connection via F1 (3 Amp self resetting fuse). Red lead to battery positive (+) terminal.
IN1	2 Way	Energiser Control Input, dry contact or switched positive voltage 12V to left hand of input pair (Terminal block and Molex connector). This input will arm and disarm both Zones of the Energiser. Links J6,7 must be fitted to use dry contacts into these inputs and MUST NOT BE FITTED if using switched voltage
IN2	2 Way	Energiser control input, dry contact or switched positive voltage 12V to left hand of input pair (Terminal block and Molex connector). By default this input will switch the Energiser between high and low power modes. Links J6,7 must be fitted to use dry contacts into these inputs and MUST NOT BE FITTED if using switched voltage
CH1 (Output Relay 1)	3 Way	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac. By default this output will activate when Zone 1 is on AND the fence voltage has fallen below the programmed FENCE ALARM VOLTAGE for more pulses than the missed count setting. Not latched.
CH2 (Output Relay 2)	3 Way	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac. By default this output will activate when Zone 2 is on AND the fence voltage has fallen below the programmed FENCE ALARM VOLTAGE for more pulses than the missed count setting. Not Latched.
Gen (Output Relay 3)	3 Way	Isolated dry contact, Change over, Relay rated at 1A 30V. Note: DO NOT attempt to switch 240Vac. By default this output will activate when there is an Ac fail OR Low battery OR internal error. Latched for internal errors only.
Data 0V +12 (Keypad Bus)	3 Way	Supplies power and data line for an external keypad. The +12 source on the terminals is protected with a 1A self resetting fuse.
Expansion (Display Port)	10 Way	The display port allows a LCD display to be connected to the Energiser to display feedback voltages and status lights. A picture of the LCD display can be found in LCD Voltage Display

8.2 High Voltage Terminals

8.2.1 PAE1015 High Voltage Terminals

Figure 14 - PAE1015 High Voltage Output Terminals

8.2.2 PAE1020 HIGH VOLTAGE TERMINALS

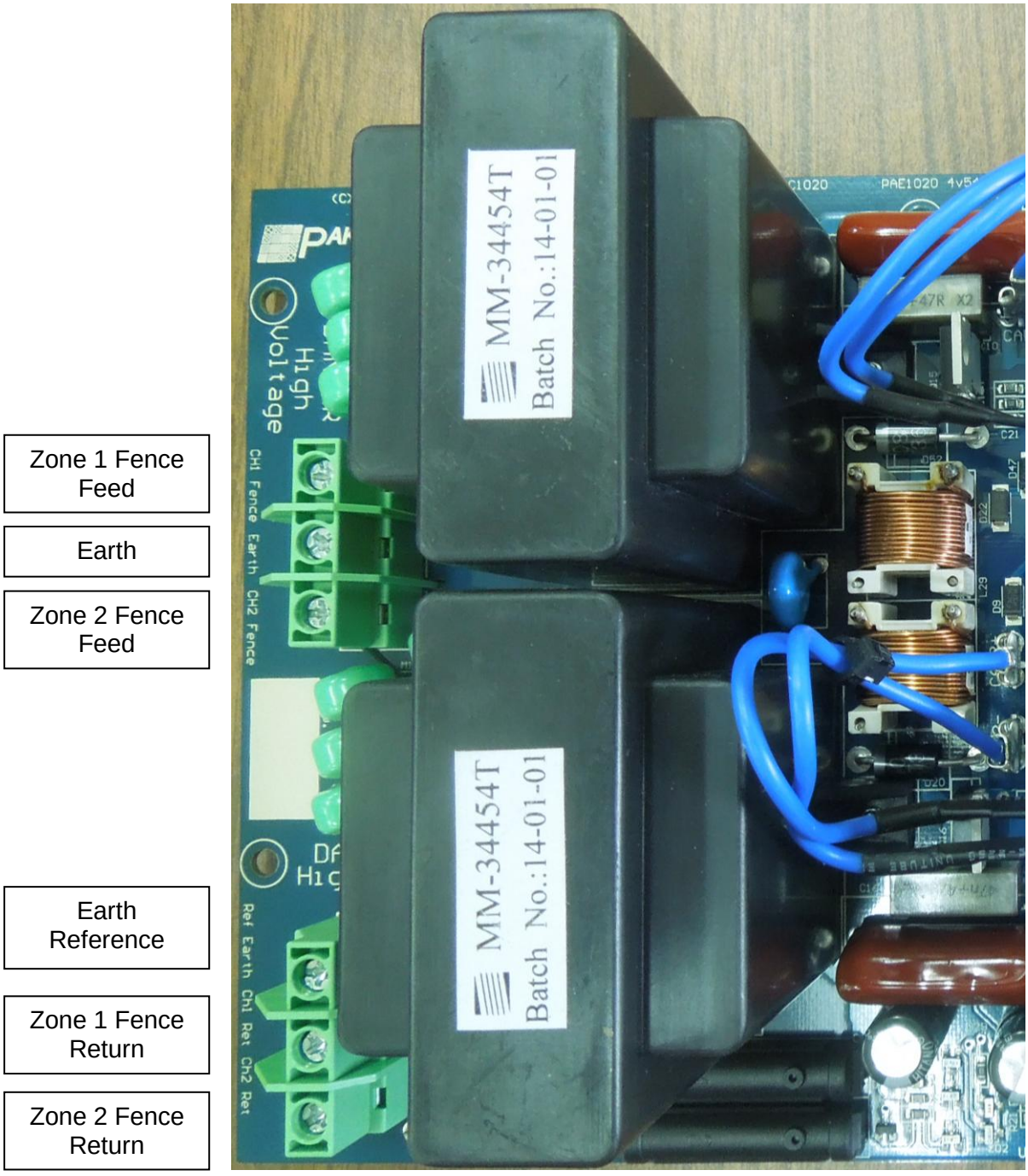


Figure 15 - PAE1020 High Voltage Output Terminals

NOTE: The order of the return terminals is different to that of the output terminals.

8.3 Power Options

The PAE101x requires 16Vac to operate; this is via a plug pack transformer and is usually supplied with the Energiser. In some markets the Energiser has the transformer inside.

PAE101x Energisers from versions PAE101x 5.3 and PAE102x 4.3 onwards will run without a battery if required.

8.4 Battery Information

Use only 12V sealed lead acid **rechargeable** batteries.

IMPORTANT NOTE:

Use only rechargeable batteries. Always ensure adequate ventilation is given to the enclosure if it houses a battery. Lead Acid batteries may emit explosive gases while charging!

To replace the battery: Turn the Energiser off. Disconnect the external power source (16Vac). Open the cover. Disconnect the old battery and remove. Connect a new battery making sure to observe the polarity, red lead to positive (+) terminal.

Ensure you dispose of old battery properly; they should not end up in land fill. Check with your local council or lead acid battery disposal procedures or call your local recycling centre.

If your battery leaks, remove it whilst wearing appropriate gloves; place it in a tough plastic bag before disposing of it as above.

The battery must be removed from the Energiser before the appliance is scrapped.

8.5 LEDs

For information about the status LEDs please refer to section Status LED Lights

8.6 Error Codes

Table 5 - Error Codes

Error LED Number of Flashes	Interpretation	Corrective \Action
2	16Vac Mains fail	Restore mains power
3	Low battery, bad battery	Charge or replace battery
4	PCB service fault	Return to repair/service centre

On any error the relay assigned to general alarm will go into alarm state. Minor errors will self clear if the error condition is removed. AC fail will not stop the Energiser, nor will low battery. However, without AC power, the battery will eventually be depleted and the Energiser will stop. Once AC power has been restored and the battery has recovered, the Energiser will re-arm itself automatically. A PCB fault will stop the Energiser. If an error stops the Energiser the general and fence alarms will be activated.

If an error has stopped the Energiser, turning the Energiser off will clear the error.

Should a PCB fault occur, power the Energiser down completely (remove AC and battery) then restart. Should the error recur return the Energiser for service.

8.7 Jumpers

8.7.1 PAE1015 JUMPERS

Table 6 - PAE1015 Jumper Function

Jumper	Function
J4	On to return programmable options to factory defaults on power up.
J5 (IN2)	On to switch to low power mode
J6	Watchdog bypass

8.7.2 PAE1020 JUMPERS

Table 7 - PAE1020 Jumper Function

Jumper	Function
J2	Watchdog bypass
J4	On to return programmable options to factory defaults on power up.
J6 and J7	Links +12 to drive input optos from dry contacts for IN1 and IN2. Do not use this option unless the control signal is coming from a voltage free contact i.e. a relay.

8.8 Watchdog

Both the PAE1015 and PAE1020 have a watchdog microcontroller which can toggle the 5 volt power supply to the main microcontroller. This will occur if the main microcontroller does not send the correct control signal to the watchdog.

If the control signal is too slow, does not exist, or is too fast, the watchdog microcontroller will toggle the 5 volt power supply rail to reset the main microcontroller.

8.9 Timing Diagrams

The timing diagrams below display how the siren will react to different event combinations. It is important to note that in the first three timing diagrams the auto-re-arm time is set to 30 seconds. In the fourth timing diagram it is disabled.

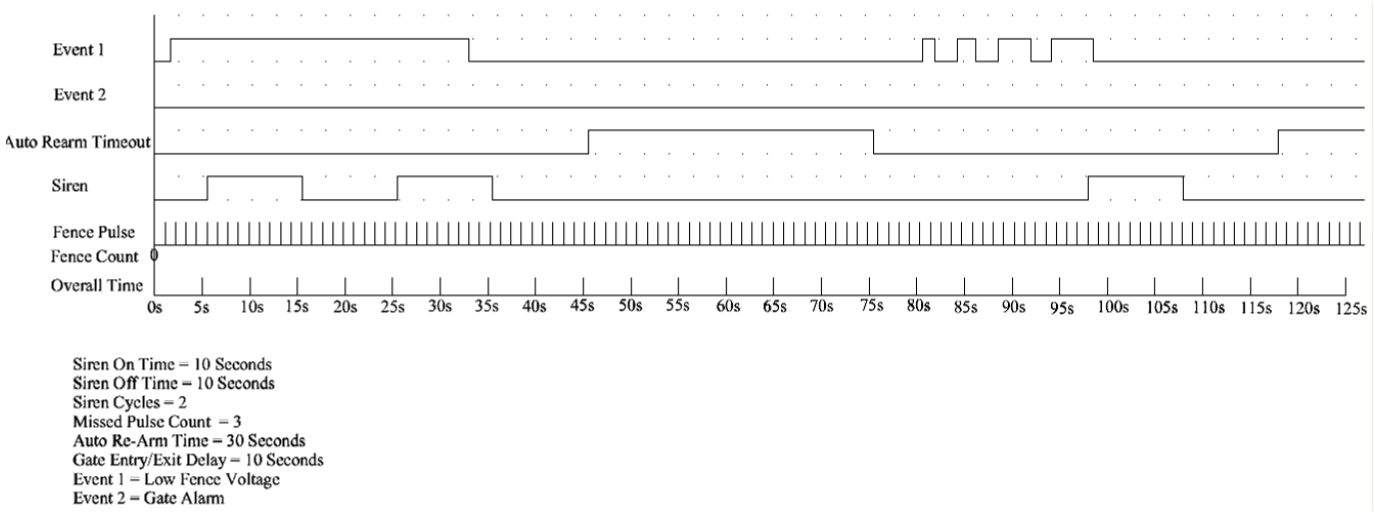


Figure 16 - Timing Diagram One

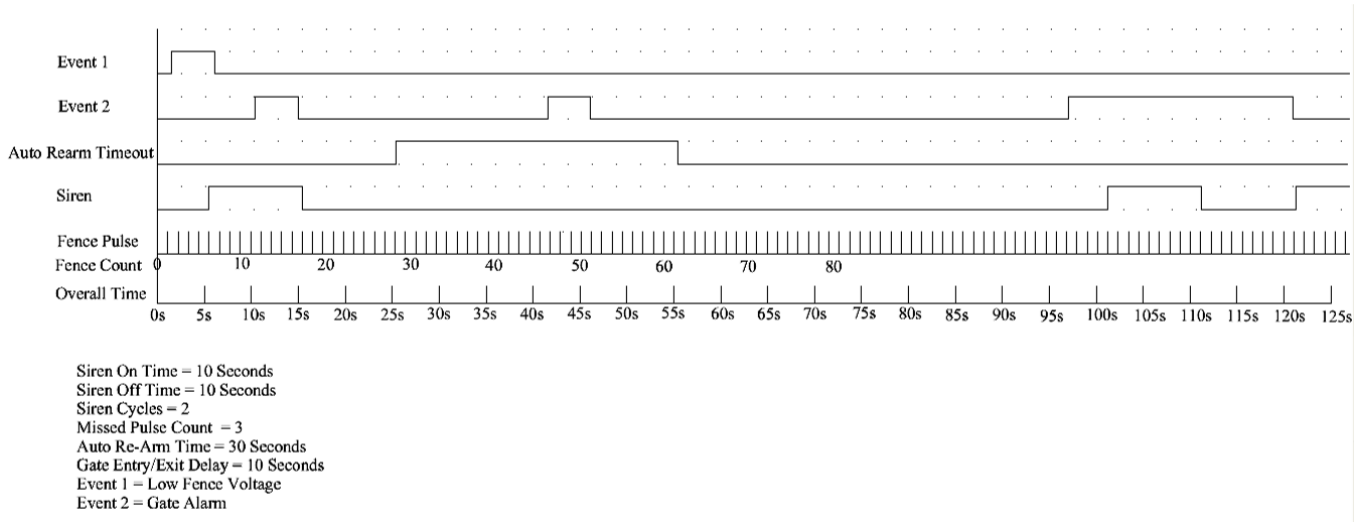
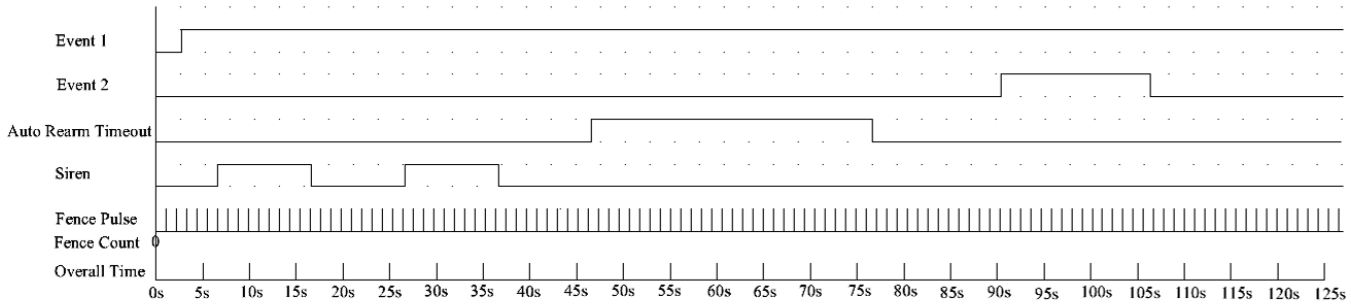
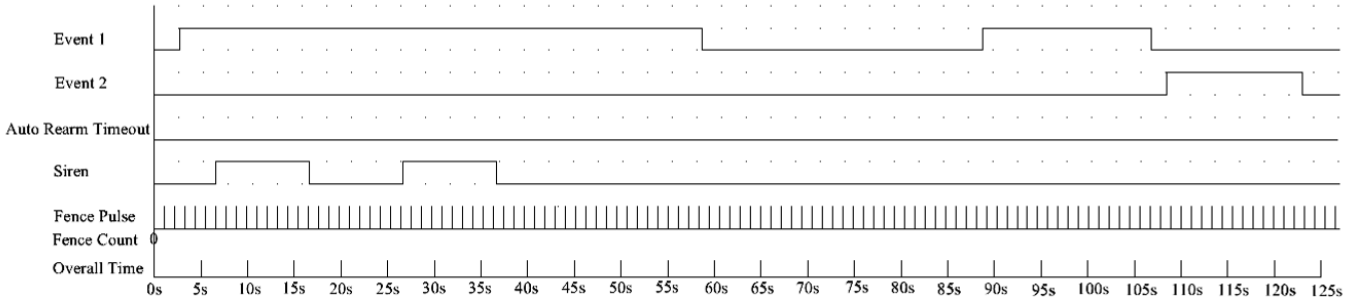


Figure 17 - Timing Diagram Two



Siren On Time = 10 Seconds
Siren Off Time = 10 Seconds
Siren Cycles = 2
Missed Pulse Count = 3
Auto Re-Arm Time = 30 Seconds
Gate Entry/Exit Delay = 10 Seconds
Event 1 = Low Fence Voltage
Event 2 = Gate Alarm

Figure 18 - Timing Diagram Three



Siren On Time = 10 Seconds
Siren Off Time = 10 Seconds
Siren Cycles = 2
Missed Pulse Count = 3
Auto Re-Arm Time = Disabled
Gate Entry/Exit Delay = 10 Seconds
Event 1 = Low Fence Voltage
Event 2 = Gate Alarm

Figure 19 - Timing Diagram Four

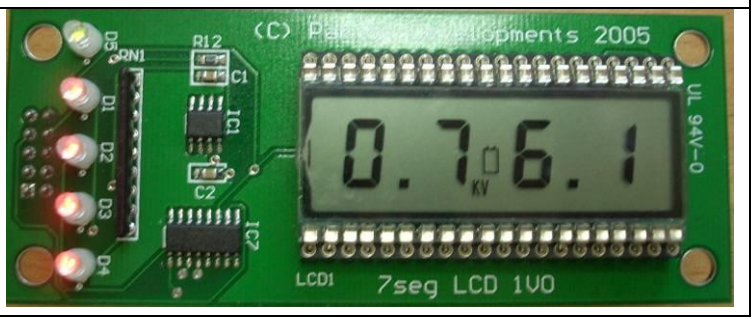
8.10 Start-up Events

When a PTE1000 series security Energiser is powered up (either from a battery or 16Vac) it will run through a set sequence of events to allow the technician to easily check for basic errors and ascertain the Energisers model number, customer number and firmware version.

When the Energiser is powered up the following events can be observed for approximately 2 seconds.

- All LED's (those on the main circuit board and on the LCD display) will be lit.
- The Beeper will sound.
- Relays will click on and off (an audible clicking can be heard)
- The Battery symbol will appear on the LCD display
- The LCD display will test the LCD segments and then display the Energisers model number, customer number and the firmware version. More details on these events can be found in Table 8 - Information Displayed on the LCD display on Start-up.

Table 8 - Information Displayed on the LCD display on Start-up

Description	LCD Display
Segment Test – To allow the technician to check that all of the segments are operational, the segments that make up each numerical character will turn on as shown in the picture to the right. **Note**: The battery symbol is shown in the middle of the screen.	
Model/Customer Number – The model number gets displayed on the left of the screen and the customer number gets displayed on the right of the screen. In the picture to the right the model number is 2 and the customer number is 1. The model number then corresponds to a model code which can be found in Table 9 - PTE1000 models. **Note**: The battery symbol is shown in the middle of the screen.	
Firmware Version – In the picture to the right the firmware version is 7v61. **Note**: The battery symbol is shown in the middle of the screen.	

Start-up test sequence is finished. All of the LED's have turned off except for the green power LED (D5). **Note**: The battery symbol is now **NOT** showing in the middle of the screen. If the battery symbol continues to show it is likely the battery voltage is low.	

8.10.1 LCD VOLTAGE DISPLAY LED LIGHTS

Power (D5)	-	On (GREEN) whenever the Energiser has power
Armed (D1)	-	On (RED) when a Zone from the Energiser is Armed
Fence (D2)	-	On (RED) when there is a fence alarm (either Zone).
Energiser (D3)	-	On (RED) when there is a Trouble with the Energiser e.g. AC Fail, Low Battery
Error (D4)	-	Flashes an error code (RED) for Energiser (service) errors. See section Error Codes.

8.11 Model and Customer Numbers Explained

On PTE1000 series of security Energisers during power up the model and customer number will be displayed on the LCD display (as discussed in the previous subsection) on Energisers running firmware versions 7v61 and higher. Each customer will have their own customer number which can be obtained by contacting Pakton.

The table below shows the relationship between the model number and the model codes.

Model Number	Model Code
1	PAE1020
2	PAE1010
8	PAE1020 (high power)
9	PAE1015

Table 9 - PTE1000 models

8.12 Known Bugs

This section contains a list of known firmware and hardware bugs in the PAE101x and PAE102x. As new bugs are found, they will be added to this section. As the bugs are fixed they will be removed from this section.

8.12.1 BUGS AFFECTING ALL PAE10XX

Known bugs in version 7v76 firmware:

- If AC is removed, low bat/flat bat alarms do not come on straight away but about 5 min later.
- Removing the main capacitor from the circuit will not cause an error 4.
- Setting CHIME MODE (14x#) to *Siren* will not work unless INPUT 2 FUNCTION is set to *Gate.*

8.12.2 PAE102X KNOWN BUGS

- It is not currently possible to control each Zone of a PAE102x independently using a keypad: 1234*12# should start zone2 but instead starts Energiser ID2 and an error message (Invalid Entry) comes up on the keypad. Note that each zone can be independently controlled by a PC running Perimeter Patrol.
- When input IN2 is configured as a gate, the Energiser will alarm if the contact is closed, not open.
- The Fence LED does not flash when the voltage on Zone 2 is below the FENCE ALARM VOLTAGE for the MISSED PULSE COUNT. It does turn ON when in Fence Alarm.
- The AC fail alarm does not show on the JVA keypad.

8.13 LCD Error Messages

Introduced in version 7.80 the LCD will now display some error messages. At start up if any of the Power On Start up Tests (POST) fail an error message will be displayed after the version number. If these are “non-fatal” the energiser will continue through start-up and be ready to run.

After any “fatal” error the LCD will now show a number which will aid in fault finding.

LCD Error Message	Meaning
“Fatal” errors	These will stop the unit
Er-12	Capacitor unplugged or “bad”
Er-13	Capacitor cannot charge
Er-14	SCR is fast firing
Er-15	Capacitor failed to discharge
Er-16	Slave Energiser cannot see the Master Energiser via Keypad Bus

Table 10 – LCD Error Message Codes

9 Installation Programming Options

The PAE101x and PAE102x have non-volatile memory in which are held programming options (SETUP PARAMETERS). These are factory pre-set but can be field programmed using a keypad.

9.1 Programming Mode

To enter programming mode, enter the 6 digit installer **PIN** followed by ***0#** keys. The keypad will beep twice to indicate that the command was accepted. If the **PIN** was incorrect the keypad will beep 3 times. The LCD will now show the first programming option and its current setting.

Pressing the # key will cycle through all the options on the LCD expansion board.

Note: Not all numbers are used.

The default installer **PIN** is 012345.

9.2 To Exit Programming Mode

Press ***#** to exit. If left unattended the Energiser will *time out* and *auto exit* after approximately 5 minutes.

9.3 Changing the Installer PIN

The installer **PIN** may only be changed while in programming mode.

To enter a new installer pin, press 00 followed by the new 6 digit **PIN,** then the **#** key.

If you cannot remember your Installer or User PIN, return the Energizers' memory to default. To do this, remove power (AC off and disconnect the battery), open the Energiser, fit jumper J4 and reconnect the battery for about 10 seconds. The Energiser should now be returned to its factory default settings. Do not forget to remove J4 once the Energiser has been returned to defaults.

9.4 Changing an Option

Most of the options have possible values in the range of 0 to 9.

To change any options, first check the option number (see table below) and then the table of values for that option. Then press the **option number** followed by the required **value** followed by #.

For example, to change the POWER LEVEL to maximum press **019#**, the keypad will beep twice to indicate that the command was successful. The LCD will immediately show the updated value.

9.5 Programming Options in Brief

9.5.1 PAE1015 PROGRAMMING OPTIONS IN BRIEF

Table 11 – PAE101x Programming Options in Brief

Option	Function	Description
01	POWER LEVEL	Sets the output power levels
02	LOW POWER LEVEL	Sets the output power levels used in Low Power mode
03	FENCE ALARM VOLTAGE	Sets the voltage threshold below which the fence alarm will occur
04	Not used	
05	LOW POWER ALARM VOLTAGE	Sets the voltage threshold below which the fence alarm will occur in Low Power mode
06	MISSED PULSE COUNT	Sets the number of pulses which may be missed before the alarm is activated
07	BATTERY ALARM VOLTAGE	Sets the battery voltage threshold below which the general alarm will activate
08	SIREN ON TIME	Sets the time that the siren (and keypad beeper) will stay on after an alarm
09	SIREN OFF TIME	The amount of time the siren will be off for after the SIREN ON TIME has expired
10	SIREN CYCLES	The number of times the siren will sound for the SIREN ON TIME. After this many cycles the siren will automatically mute
11	INPUT TYPE	Allows the Control Inputs to be changed from normally open to normally closed.
12	INPUT 2 FUNCTION	Gate Switch or Low Power Switch
13	GATE ENTRY/EXIT DELAY	Time from gate switch opening to alarm
14	CHIME MODE	Allows the keypad and internal beeper function to be altered
15	FENCE MODE	Bi-Polar or Conventional mode
16	Not used	
17	Not used	
18	BINARY OPTION2	Miscellaneous options
19	KEYPAD DETECT	Allow back compatibility with older PC code.
20	AUTO REARM TIME	Sets the time which must elapse after an alarm has timed out (completed the SIREN CYCLES) before the Energiser will automatically re-arm ready for the next alarm event.
21	RELAY 1	Used to assign a function to relay 1
22	RELAY 2	Used to assign a function to relay 2
23	Not used	
24	Not used	
25	Not used	
26	GROUP ID	Allows the Energiser to be set as a Master or Slave in a synchronised group. Not available in all markets.

9.5.2 PAE1020 PROGRAMMING OPTIONS IN BRIEF

Table 12 - PAE102x Programming Options in Brief

Option	Function	Description
01	POWER LEVEL	Sets the output power levels
02	LOW POWER LEVEL	Sets the output power levels used in low power mode
03	FENCE ALARM VOLTAGE ZONE1	Sets the voltage threshold below which the fence alarm will occur for Zone 1.
04	FENCE ALARM VOLTAGE ZONE2	Sets the voltage threshold below which the fence alarm will occur for Zone 2.
05	LOW POWER ALARM VOLTAGE	Sets the voltage threshold below which the fence alarm will occur in low power mode
06	MISSED PULSE COUNT	Sets the number of pulses which may be missed before the alarm is activated
07	BATTERY ALARM VOLTAGE	Sets the battery voltage threshold below which the general alarm will activate
08	SIREN ON TIME	Sets the time that the siren (and keypad beeper) will stay on after an alarm
09	SIREN OFF TIME	The amount of time the siren will be off for after the SIREN ON TIME has expired
10	SIREN CYCLES	The number of times the siren will sound for the SIREN ON TIME. After this many cycles the siren will automatically mute
11	INPUT TYPE	Allows the Control Inputs to be changed from normally open to normally closed.
12	INPUT 2 FUNCTION	Gate Switch or Low Power Switch or On/Off Zone 2
13	GATE ENTRY/EXIT DELAY	Time from gate switch opening to alarm
14	CHIME MODE	Allows the keypad and internal beeper function to be altered
15	Not used	
16	CROSS COUPLING	The Energiser checks for a short between the two Zones.
17	Not used	
18	Not used	
19	KEYPAD DETECT	Allow back compatibility with older PC code.
20	AUTO REARM TIME	Sets the time which must elapse after an alarm has timed out (completed the SIREN CYCLES) before the Energiser will automatically re-arm ready for the next alarm event.
21	RELAY 1	Used to assign a function to relay 1
22	RELAY 2	Used to assign a function to relay 2
23	RELAY 3	Used to assign a function to relay 3
24	Not used	
25	Not used	
26	GROUP ID	Allows the Energiser to be set as a Master or Slave in a synchronised group. Not available in all markets.

9.6 Programming Options in Detail

9.6.1 PAE1015 PROGRAMMING OPTIONS IN DETAIL

9.6.1.1 Power Level (01x#)

The POWER LEVEL option allows the shocking power of the fence to be adjusted. For example: To change the POWER LEVEL to *maximum* enter the following **0 1 9 #** or **0 1 0 9 #**. The keypad will beep twice to indicate that the new setting has been accepted.

The normal fence voltage depends on the amount of fence wire, the losses and the POWER LEVEL.

This setting affects the average power drain and therefore backup battery time.

Kilovolt settings refer to a ***1000 Ohm load*** *(**Coventional**: Connect between Return+ and Gnd (Feed-)*, ***Bi-Polar:** Connect between Return- and Return+),* actual fence voltages will depend on the type and length of fence.

Value (x)	Voltage Conventional mode	Voltage Bi-Polar Mode
0	5.0kV	2.5kV
1	5.5kV	2.8kV
2	6.0kV	3.0kV
3	6.5kV	3.3kV
4	7.0kV	3.5kV
5	7.5kV	3.8kV
6	8.0kV	4.0kV
7	8.5kV	4.3kV
8	9.0kV	4.5kV
9	9.5kV	4.5kV

Table 13 – Power level

9.6.1.2 Low Power Level (02x#)

Same as above, but for Low Power mode.

It is recommended that this option is set when the Energiser is connected to the Fence Zone with the Energiser running in Low Power mode.

Kilovolt settings refer to a ***1000 Ohm load*** *(**Coventional**: Connect between Return+ and Gnd (Feed-)*, ***Bi-Polar:** Connect between Return- and Return+),* actual fence voltages will depend on the type and length of fence.

Value (x)	Voltage Conventional Mode	Voltage Bi-Polar Mode
0	0.3kV	0.15kV
1	0.32kV	0.16kV
2	0.37kV	0.185kV
3	0.5kV	0.25kV
4	0.6kV	0.3kV
5	0.7kV	0.35kV
6	0.8kV	0.4kV
7	0.9kV	0.45kV
8	1.0kV	0.5kV
9	1.1kV	0.55kV

Table 14 - Low Power Level Values

9.6.1.3 Fence Alarm Voltage (03x#)

This option sets the voltage threshold below which the fence alarm will occur. The default FENCE ALARM VOLTAGE is 3 kV. In Bi-Polar mode this threshold is for both positive and negative fence wires.

Value (x)	Voltage Conventional Mode	Voltage Bi-Polar Mode
0	1.5kV	1.5kV
1	2.0kV	1.8kV
2	2.5kV	2.1kV
3	3.0kV	2.4kV
4	3.5kV	2.7kV
5	4.0kV	3.0kV
6	4.5kV	3.3kV
7	5.0kV	3.6kV
8	5.5kV	3.9kV
9	6.0kV	4.2kV

Table 15 - Fence Alarm Voltage Values

9.6.1.4 Low Power Alarm Voltage (05x#)

This option sets the voltage threshold below which the fence alarm will occur. The default fence LOW POWER ALARM VOLTAGE is 500 Volts.

Value (x)	Voltage
0	300 Volts
1	500 Volts
2	700 Volts
3	900 Volts
4	1100 Volts

Table 16 - Low Power Alarm Voltage Values

9.6.1.5 Missed Pulse Count (06x#)

This option enables the pulse count to be varied from the default (3). This is the number of bad or missing pulses that are counted before the alarm occurs. Note: The lower this option is set the more likely you are to get false alarms.

Value (x)	Missed Pulses
0	1
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Table 17 - Missed Pulse Count Values

9.6.1.6 Battery Alarm Voltage (07x#)

This option sets the battery voltage threshold below which the General alarm will activate. The default BATTERY ALARM VOLTAGE is 11.0 Volts and the Energiser will drop to Low Power at 10.0 Volts (after beeping 4 times).

If the Energiser enters Low Power mode due to a flat battery, the Energiser will automatically return to high voltage, without warning, when the mains voltage comes back on and the battery voltage rises.

Keypad number	Alarm	Reduce Power
0	9.0 V	8.0 V
1	9.5 V	8.5 V
2	10.0 V	9.0 V
3	10.5 V	9.5 V
4	11.0 V	10.0 V
5	11.5 V	10.5 V
6	12.0 V	11.0 V
7	12.5 V	11.5 V
8	13.0 V	12.0 V
9	13.5 V	12.5 V

Table 18 - Battery Alarm Voltage Values

9.6.1.7 Siren On Time (08x#)

This option sets the duration of time that the siren will remain on after a fence alarm occurs. After this time the siren will turn off for the SIREN OFF TIME. The siren will sound again if the alarm is still present after this *off* time has passed.

The default is 3 Minutes. This may be the subject of local regulations to stop an alarm causing undue disturbance to neighbours, etc.

Note: the SIREN ON TIME will be cut short if the battery falls below the low battery level.

Value	Time
0	10 Seconds
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	8 Minutes

Table 19 - Siren On Time Values

9.6.1.8 Siren Off Time (09x#)

This option sets the amount of time the siren will be off for after the SIREN ON TIME has expired. If an alarm is still present after this *off* time the siren will sound again.

Value	Time
0	10 Seconds
1	1 Minute
2	2 Minute
3	5 Minutes
4	10 Minutes
5	20 Minutes
6	30 Minutes
7	40 Minutes
8	50 Minutes
9	60 Minutes

Table 20 - Siren Off Time Values

9.6.1.9 Siren Cycles (10x#)

This option sets the maximum number of times the siren will sound for the SIREN ON TIME if the alarm continues. This may be limited by local regulations to stop an alarm causing undue disturbance to neighbours etc.

Note: This is the maximum number of cycles for 1 continuous alarm, intermittent alarm events could cause more than this number of siren soundings.

Value	Cycles
0	1
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Table 21 - Siren Cycles Values

9.6.1.10 Input Type (11x#)

The PAE1015 Control Inputs can be inverted.

Unless the Control Input 2 is used for a Gate switch, in which case it is always NC.

Value (x)	Input type
0	NO Normally open
1	NC Normally Closed

Table 22 - Input Type Values

9.6.1.11 Input 2 Function (12x#)

This option is used to set the function for Control Input 2. If set to 0, the gate alarm will trigger if the gate is opened. If set to 1, the Energiser will go into Low Power if the input is closed.

Value	Function	Default
0	Gate	
1	Low Power	Customer 1,4

Table 23 – Gate Input Function/Low Power Mode Values

9.6.1.12 Gate Entry/Exit Delay (13x#)

This option sets the time between the gate switch opening and the siren sounding.

Value	Time
0	10 Seconds
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	8 Minutes

Table 24 - Gate Entry/Exit Delay Values

9.6.1.13 Chime Mode (14x#)

This option allows the Energiser internal and keypad beeper to be used as a door chime for the gate switch.

When set to *None*, the keypad beeper is used to indicate correct keypad operation only.

In *Door Chime* mode, the beepers sound when the gate switch opens, even if the Energiser is disarmed. Note "Gate" must be selected in option 12.

If set to *Siren,* the beepers mimic the siren function.

Fence Alarm will force the beeper to sound when there is a Fence Alarm.

Value	Function
0	None
1	Door Chime
2	Siren
3	Fence Alarm

Table 25 - Chime Mode Values

9.6.1.14 Fence Mode (15x#)

This option sets *Bi-Polar* or *Conventional* modes.

Note: PAE1015 for Gato is fixed in Bi-Polar mode.

Value	Function
0	Bi-Polar
1	Conventional

Table 26 - Fence Mode Values

9.6.1.15 Binary Options 2 (18x#)

Each option in this table can be turned on by adding the corresponding value.

For option+ 1 set 18 to 01, for + 1 and +2 set to 03.

+1: Enable Siren Acknowledge. The siren will chirp once for armed and twice for disarmed.

+2: Enables a home alarm style entry/exit delay for the gate input. See also Gate Entry/Exit Delay (13x#).

+4: Sets the keypad bus baud rate to 4800 (default is 2400), all units in a group, PC and Keypad must be set to the same baud rate. The change will not take effect until after a reset.

+8: Sets the keypad bus baud rate to 9600 (default is 2400)

Note: +2, +4 and +8 were added in code version 7v92.

Value	Function
0	None
+1	Siren codes
+2	Gate delay type
+4	4800 baud
+8	9600 baud
+16	
+32	

Table 27 – Binary Options 2

9.6.1.16 Auto Re-Arm Time (20x#)

This option sets the time which must elapse before another alarm will sound after the first alarm has timed out (gone completely through its cycles without being turned off).

If an event occurs (such as a low fence voltage) which triggers the siren, any other events which would otherwise trigger the siren (such as a gate alarm) will be ignored while the siren is sounding and until after the Auto re-arm time has passed. Timing diagrams displaying how the siren reacts to different event combinations are available in section 7.5 of this manual

If this time is set to less than the SIREN OFF TIME, the Energiser may re-arm in the "Off" time and the number of SIREN CYCLES will be reduced.

Value	Time
0	0 Seconds (Immediate)
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	Disabled – Do not auto rearm

Table 28 - Auto Re-Arm Time Values

9.6.1.17 Relay Functions

All relays can be set to any of the available functions (user assignable).

RELAY 1 is **(21x#)**
RELAY 2 is **(22x#)**

The modes are explained in the table on the following page.

The defaults for the PAE1015:

- RELAY 1 – Fence Bi-Polar
- RELAY 2 – General

Value (x)	Mode
0	Fence 1
1	Fence 1 or off
2	Armed 1
3	Fence 2
4	Fence 2 or off
5	Armed 2
6	Fence Bi-Polar
7	General
8	Siren
9	Strobe
10	AC Fail
11	Low / Bad Battery
12	Tamper
13	Strobe 2
14	Gate 1 or 2
15	Siren caused by Gate 1 or 2
16	Armed in Low Power Mode
17	Group Armed Note 2
18	Group General

Table 29 – Relay Function Values

Notes:

1. The siren and strobe switched 12V outputs can be used to drive external buffer relays.
2. Group relay functions are only operable on the group master

Table 30 - Logic for alarm states

Function	Logic for alarm state (opposite of normal state)
Fence x	Fence x Alarm: Zone x is Armed (Pulsing) AND the Fence Return Voltage has fallen below the FENCE ALARM VOLTAGE for more pulses than the MISSED PULSE COUNT. Not latched.
Fence x alarm or off	Zone x is Off OR the Fence Return Voltage has fallen below the FENCE ALARM VOLTAGE for more pulses than the MISSED PULSE COUNT. Not Latched.
Fence Bi-polar	Energiser is Armed (Pulsing) AND the Fence Return Voltages on either Bi-polar return line has fallen below the FENCE ALARM VOLTAGE for more pulses than the MISSED PULSE COUNT. Not latched.
Armed x	Zone x is Armed (Pulsing)
General	AC Fail OR Tamper OR Low Battery OR Gate Alarm OR Internal Error. Latched for internal errors only.
Siren	Fence Alarm 1 OR Fence Alarm 2 OR Gate Or Tamper, will time out after the Siren Time Out time. This function is latched.
Strobe	As per Siren but does not time out, will remain On until both Zones are switched off. This function is latched.
AC Fail	Alarm on AC Fail
Battery	Alarm on low or bad battery
Tamper	Alarm when the lid is up and J3 is not fitted
Group wide x	Group relay functions are the collected status of the whole group of Z energisers. Group Armed for example is set only if all energisers in the group are armed.

9.6.1.18 Group ID (26x#)

A group must have only 1 master. The other Energisers in the group are slaves. Since the keypad bus is common among the group, one keypad can be used to program all Energisers for all Options except GROUP ID (for obvious reasons).

The procedure is:

Connect the keypad to each Energiser in turn. Set this Option, one Energiser as Master the other as Slaves. Wire all Energisers into a group.

Note: In some markets group mode may not be available.

For details on group wiring and operation see APPENDIX A.

Value (x)	Mode
0	No Group
1	Master
2	Slave 1
3	Slave 2
4	Slave 3
5	Slave 4
6	Slave 5
7	Slave 6
8	Slave 7
9	Slave 8

Table 31 - Group ID Values

9.6.2 PAE1020 PROGRAMMING OPTIONS IN DETAIL

Some of the default options vary depending on the customer number. Please refer to the “Default” column for these settings. If you do not know your customer number, please contact us.

9.6.2.1 Power Level (01x#)

The POWER LEVEL option allows the shocking power of the fence to be adjusted. For example: To change the POWER LEVEL to *maximum* enter the following **0 1 9 #** or **0 1 0 9 #**. The keypad will beep twice to indicate that the new setting has been accepted.

The normal fence voltage depends on the amount of fence wire, the losses and the POWER LEVEL.

This setting affects the average power drain and therefore backup battery time.

Kilovolt settings refer to a ***1000 Ohm load*** *(Connect between Gnd and Ch1 or Ch2)*, actual fence voltages will depend on the type and length of fence.

Value (x)	Voltage	Default
0	1.7kV	
1	2.2kV	
2	2.7kV	
3	3.3kV	
4	3.8kV	
5	4.4kV	
6	4.8kV	
7	5.3kV	
8	5.8kV	
9	6.3kV	Customer 4

Table 32 - Power Level Values

9.6.2.2 Low Power Level (02x#)

Same as above, but for low Power mode.

It is recommended that this option is set when the Energiser is connected to the Fence Zone with the Energiser running in Low Power mode.

Kilovolt settings refer to a ***1000 Ohm load*** *(Connect between Gnd and Ch1 or Ch2)*, actual fence voltages will depend on the type and length of fence.

Value (x)	Voltage
0	0.3kV
1	0.32kV
2	0.37kV
3	0.4kV
4	0.45kV
5	0.5kV
6	0.55kV
7	0.6kV
8	0.65kV
9	0.7kV

Table 33 - Low Power Level Values

9.6.2.3 Fence Alarm Voltage Zone 1 (03x#)

This option sets the voltage threshold below which the fence alarm will occur. The default FENCE ALARM VOLTAGE is 4 kV.

Value (x)	Voltage
0	1.5kV
1	2.0kV
2	2.5kV
3	3.0kV
4	3.5kV
5	4.0kV
6	4.5kV
7	5.0kV
8	5.5kV
9	6.0kV

Table 34 - Fence Alarm Voltage Values

9.6.2.4 Fence Alarm Voltage Zone 2 (04x#)

This option sets the voltage threshold below which the fence alarm will occur. The default FENCE ALARM VOLTAGE is 4 kV.

Value (x)	Voltage
0	1.5kV
1	2.0kV
2	2.5kV
3	3.0kV
4	3.5kV
5	4.0kV
6	4.5kV
7	5.0kV
8	5.5kV
9	6.0kV

Table 35 - Fence Alarm Voltage Values

9.6.2.5 Low Power Alarm Voltage (05x#)

This option sets the voltage threshold below which the fence alarm will occur. The default fence Alarm Voltage is 500 Volts.

Value (x)	Voltage
0	300 Volts
1	500 Volts
2	700 Volts
3	900 Volts
4	1100 Volts

Table 36 - Low Power Alarm Voltage Values

9.6.2.6 Missed Pulse Count (06x#)

This option enables the pulse count to be varied from the default (3). This is the number of bad or missing pulses that are counted before the alarm occurs. Note: The lower this option is set the more likely you are to get false alarms

Value (x)	Missed Pulses
0	1
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

9.6.2.7 Battery Alarm Voltage (07x#)

This option sets the battery voltage threshold below which the General alarm will activate. The default BATTERY ALARM VOLTAGE is 11.0 Volts and the Energiser will drop to low power at 10.0 Volts (after beeping 4 times).

If the Energiser enters Low Power mode due to a flat battery, the Energiser will automatically return to high voltage, without warning, when the mains voltage comes back on and the battery voltage rises.

Keypad number	Alarm	Reduce Power
0	9.0 V	8.0 V
1	9.5 V	8.5 V
2	10.0 V	9.0 V
3	10.5 V	9.5 V
4	11.0 V	10.0 V
5	11.5 V	10.5 V
6	12.0 V	11.0 V
7	12.5 V	11.5 V
8	13.0 V	12.0 V
9	13.5 V	12.5 V

Table 37 - Battery Alarm Voltage Values

9.6.2.8 Siren On Time (08x#)

This option sets the duration of time that the siren will remain on after a fence alarm occurs. After this time the siren will turn off for the SIREN OFF TIME. The siren will sound again if the alarm is still present after this *off* time has passed.

The default is 3 Minutes. This may be the subject of local regulations to stop an alarm causing undue disturbance to neighbours, etc.

Note: the SIREN ON TIME will be cut short if the battery falls below the low battery level.

Value	Time
0	10 Seconds
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	8 Minutes

Table 38 - Siren On Time Values

9.6.2.9 Siren Off Time (09x#)

This option sets the amount of time the siren will be off for after the SIREN ON TIME has expired. If an alarm is still present after this *off* time the siren will sound again.

Value	Time
0	10 Seconds
1	1 Minute
2	2 Minute
3	5 Minutes
4	10 Minutes
5	20 Minutes
6	30 Minutes
7	40 Minutes
8	50 Minutes
9	60 Minutes

Table 39 - Siren Off Time Values

9.6.2.10 Siren Cycles (10x#)

This option sets the maximum number of times the siren will sound for the SIREN ON TIME if the alarm continues. This may be limited by local regulations to stop an alarm causing undue disturbance to neighbours etc.

Note: This is the maximum number of cycles for 1 continuous alarm, intermittent alarm events could cause more than this number of siren soundings.

Value	Cycles
0	1
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Table 40 - Siren Cycles Values

9.6.2.11 Input Type (11x#)

The PAE1020 inputs can be inverted.

Unless the Control Input 2 is used for a Gate switch, in which case it is always NC.

Value (x)	Input type
0	NO Normally open
1	NC Normally closed

Table 41 - Input Type Values

9.6.2.12 Input 2 Function (12x#)

This option is used to set the function for Control Input 2.

If set to 0, the gate alarm will trigger if the gate is opened.

If set to 1, the Energiser will go into Low Power mode if the IN2 is opened, High Power mode will operate if IN2 is closed.

A setting of 2 will enable independent control of Zone 2.

The default may differ depending on customer.

Value	Function	Default
0	Gate	
1	Low Power	Customer 1
2	On/Off Ch2	Customer 4

Table 42 – Gate Input Function/Low Power Mode Values

9.6.2.13 Gate Entry/Exit Delay (13x#)

This option sets the time between the gate switch opening and the siren sounding.

Value	Time
0	10 Seconds
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	8 Minutes

Table 43 - Gate Entry/Exit Delay Values

9.6.2.14 Chime Mode (14x#)

This option allows the Energiser internal and keypad beeper to be used as a door chime for the gate switch.

When set to *None*, the keypad beeper is used to indicate correct keypad operation only.

In *Door Chime* mode, the beepers sound when the gate switch opens, even if the Energiser is disarmed. Note "Gate" must be selected in option 12.

If set to *Siren,* the beepers mimic the siren function.

Fence Alarm will force the beeper to sound when there is a Fence Alarm.

Value	Function
0	None
1	Door Chime
2	Siren
3	Fence Alarm

Table 44 - Chime Mode Values

9.6.2.15 Cross Couple Mode (16x#)

If this option is enabled the Energiser will check if there is a short between the two Zones and go into alarm if there is a short between the two Zones.

Value	Function
0	Cross Couple Check Disabled
1	Cross Couple Check Enabled

Table 45 – Cross Couple Mode Values

9.6.2.16 Keypad Detect (19x#)

Setting 19 = 1 locks the Energiser to poll keypad ID 8 only. This is the LED keypad.

This was added in code version 7v76c for back compatibility with older PC code.

Value	Function
0	Poll All
1	Poll ID 8

Table 46 – Keypad Detect

9.6.2.17 Auto Re-Arm Time (20x#)

This option sets the time which must elapse before another alarm will sound after the first alarm has timed out (gone completely through its cycles without being turned off).

If an event occurs (such as a low fence voltage) which triggers the siren, any other events which would otherwise trigger the siren (such as a gate alarm) will be ignored while the siren is sounding and until after the Auto re-arm time has passed. Timing diagrams displaying how the siren reacts to different event combinations are available in section 7.5 of this manual

A setting of 0 will disable auto re-arm.

Value	Time
0	Do not re-arm
1	30 Seconds
2	1 Minute
3	2 Minutes
4	3 Minutes
5	4 Minutes
6	5 Minutes
7	6 Minutes
8	7 Minutes
9	8 Minutes

Table 46 - Auto Re-Arm Time Values

9.6.2.18 Relay Functions

All relays can be set to any of the available functions (user assignable).

RELAY 1 is **(21x#)**
RELAY 2 is **(22x#)**
RELAY 3 is **(23x#)**

The modes are explained in the table on the following page.

The defaults for the PAE1020:

- RELAY 1 – Fence 1
- RELAY 2 – Fence 2
- RELAY 3 – General

Value (x)	Mode
0	Fence 1
1	Fence 1 or off
2	Armed 1
3	Fence 2
4	Fence 2 or off
5	Armed 2
6	Unused
7	General
8	Siren
9	Strobe 1
10	AC Fail
11	Low / Bad Battery
13	Strobe 2
14	Gate

Table 47 - Relay Functions Values

Table 48 - Logic For Alarm States

Function	Logic for alarm state (opposite of normal state)
Fence x	Fence Zone x is on (Armed) AND there is a Fence Alarm (fence voltage has fallen below the FENCE ALARM VOLTAGE for more pulses than the MISSED PULSE COUNT). Not latched.
Fence x or off	Fence Zone x is off (Disarmed) OR the fence voltage has fallen below the programmed FENCE ALARM VOLTAGE for more pulses than the missed count setting. Not Latched.
Armed x	Fence Zone x is off (Disarmed)
General	Ac fail OR Low battery OR internal error. Latched for internal errors only.
Siren	Fence Alarm 1 OR Fence Alarm 2, will time out after the siren time out time. This function is latched.
Strobe	As per siren but does not time out, will remain on until both Zones are switched off. This function is latched.
AC Fail	Alarm on Ac Fail
Battery	Alarm on low or bad battery

9.6.2.19 Group ID (26x#)

A group must have only 1 master. The other Energisers in the group are slaves. Since the keypad bus is common among the group one keypad can be used to program all Energisers for all options except this one (for obvious reasons).

The procedure is:

Connect the keypad to each Energiser in turn. Set this Option, one Energiser as Master the other as Slaves. Wire all Energisers into a group.

Note: In some markets group mode may not be available.

For details on group wiring and operation see APPENDIX A.

Value (x)	Mode
0	No Group
1	Master
2	Slave 1
3	Slave 2
4	Slave 3
5	Slave 4
6	Slave 5
7	Slave 6
8	Slave 7
9	Slave 8

Table 49 - Group ID Values

10 Sector Setup Tests and Adjustment

10.1 Introduction

With a single sector/zone system there are three considerations for the electric fence monitor voltage level:

1. The monitor should trigger the alarm if one of the live wires is shorted to ground.
2. The monitor should trigger the alarm if one of the live wires is cut.
3. The monitor should not trigger the alarm when dew forms on the insulators, it rains, grass touches the wires, or spider webs, dust, etc. settles on the wires.

Use common sense and turn the Energiser off when making changes to the fence, then turn the Energiser back on to check the effects.

10.2 Basic Fence Tests

1. Energise the newly completed fence.
2. Use an Electric Fence Power Probe to find any construction faults.
3. Check that there is voltage on all live wires (continuity) and that there are no shorts from live to earth, or between live circuits (Bi-Polar).
4. Check the electric fence earth. (See electric fence manuals.) One method is to make an intentional short from live wire to earthed metal (not +ve to -ve if using Bi-Polar). The voltage at the earthed point should be less than a few hundred volts; the voltage on the earth stake with respect to any nearby earthed metal should be less than a few hundred volts.
5. Record the start and end of fence live wire voltages.
   Note: Bi-Polar systems should have approximately equal voltages with respect to earth.
6. Record the live wire currents going out from the Energiser to the fence.

At this point you must have a reasonable voltage on all parts of the fence. To be an effective barrier, the Power Probe (or voltmeter) readings between wires (live to earth or +ve to -ve for Bi-Polar) must be greater than 5.0kV. If it is not then you may require a larger Energiser.

10.3 Fault Condition Tests

1. To simulate a break, disconnect a joint(s) in the live wires at some convenient point on the fence, making sure that the wires do not short to ground or between +ve and -ve wires.
2. Check that the Energiser fence alarm activates. If not, check the voltage (using an electric fence voltmeter) at the inputs to the monitor. Set the FENCE ALARM VOLTAGE level higher than this voltage. If there is still considerable voltage, you may have induced voltage in the feedback wires. If so, reduce the induced voltage by placing a 3000 ohm resistor across the return to earth terminals (or from +ve to -ve in a Bi-Polar system) at the monitor.
3. Reconnect the live wires (from step 1).
4. Place a short on the fence live wires.
5. Check that the monitor goes into alarm.
6. Remove the short.

11 Warranty

Each OEM customer or distributor should negotiate a warranty policy with their upstream supplier.

12 Appendix A: Group Simultaneous Pulse (SP) feature

12.1 Group Simultaneous Pulse (SP) feature

In some Industrial Installations it may be preferable to provide the ability to link multiple Energisers into a group. When linked the individual PAE101x's become a "Group". Members of a group have simultaneous high voltage output pulses and act as is they are one Energiser with multiple outputs. This is designed so that no possible combination of individual outputs can be dangerous. [1]

12.2 Group Mode Programming (26x#)

A group must have only 1 master. The other Energisers in the group are slaves.

Note1: *Do not interconnect the Energisers via the keypad bus until after they are programmed.*

For all Energisers that will be part of a group, the procedure is as follows:

1. Connect the keypad.
2. Connect the battery.
3. If the Energiser starts running disarm it.
4. On the keypad, enter [Installer's code] [*] [0] [#], then [26].
5. Enter the required value (e.g. [1] for master) then [#].
6. Enter [*] [#] to exit programming.
7. Connect the group using the keypad bus as per Figure 20 - Group Mode Linking.

Value (x)	Mode
0	No Group
1	Master
2	Slave 1
3	Slave 2
4	Slave 3
5	Slave 4
6	Slave 5
7	Slave 6
Etc	Etc
15	Slave 14

Note2: *At this time groups are limited to a master and 14 slaves.*

Note3: If Perimeter Patrol is used any keypad in the system should not have address 2, (see 7.2 Changing the Keypad Messages and Address*)*.

12.2.1 GROUP LINKING VIA THE KEYPAD "BUS"

The keypad terminals on all Energisers in the group are linked, see Figure 18. Since only one Energiser needs to power the keypad 3 wires are linked from one Energiser to the keypad (optional) and 2 wires to every other Energiser in the group. Do not connect the + lines between PAE101x's as this could result in some strange behaviour and possibly damage.

Note: the connections can be a star or daisy chain or any mixture. If required, the bus can be split using an opto isolator module. This is necessary in noisy (EMF) environments or if the bus is longer than 100m. It is also possible for a PC to be added to the group using a keypad to RS232 Bridge (PAE051).

Notes:

1. Members of a group can be individually switched on and off, even the master can be turned off via input or key switch.
2. A slave will alarm if the keypad bus is broken between it and the group master.
3. After programming the Keypad may be disconnected, it is not required for group operation.

[1] Patented

We recommend following these steps in the right order:

1. Disarm all energisers in the group. If energisers are not disarmed Step 10 may not work correctly.
2. Program the keypad address using one of the energisers.
3. Program each energiser with its required address (Master address=1, Slave 1 address=2...).
4. Connect any control/monitoring unit 12V, GND and Data to the Group Master
5. Connect all the slaves Data and GND to the Group Master.
6. Connect the battery and AC power of the Group Master but do not arm.
7. Connect the battery and AC power of each slave Note: Do not arm them until all the Energisers in the group are connected
8. Wait 5 minutes for all the Energisers to synchronise with the Master
9. If there are more than one keypad or control unit, make sure they have a different ID then reset the group using keypad code: *user pin+ **+ *6+ *8+ *#+ or Perimeter Patrol “Reset All” this will allow both keypads to be recognised by all energisers in the group.
10. If using a PTE0210 keypad (refer to 7.3), enter the key sequence [*][6][8][#] to automatically re-scan the group and check what energisers are connected.
11. Arm the group using keypad [1] [2] [3] [4] [*] [1] [0] [#] or Perimeter Patrol, make sure all Energisers are activated.

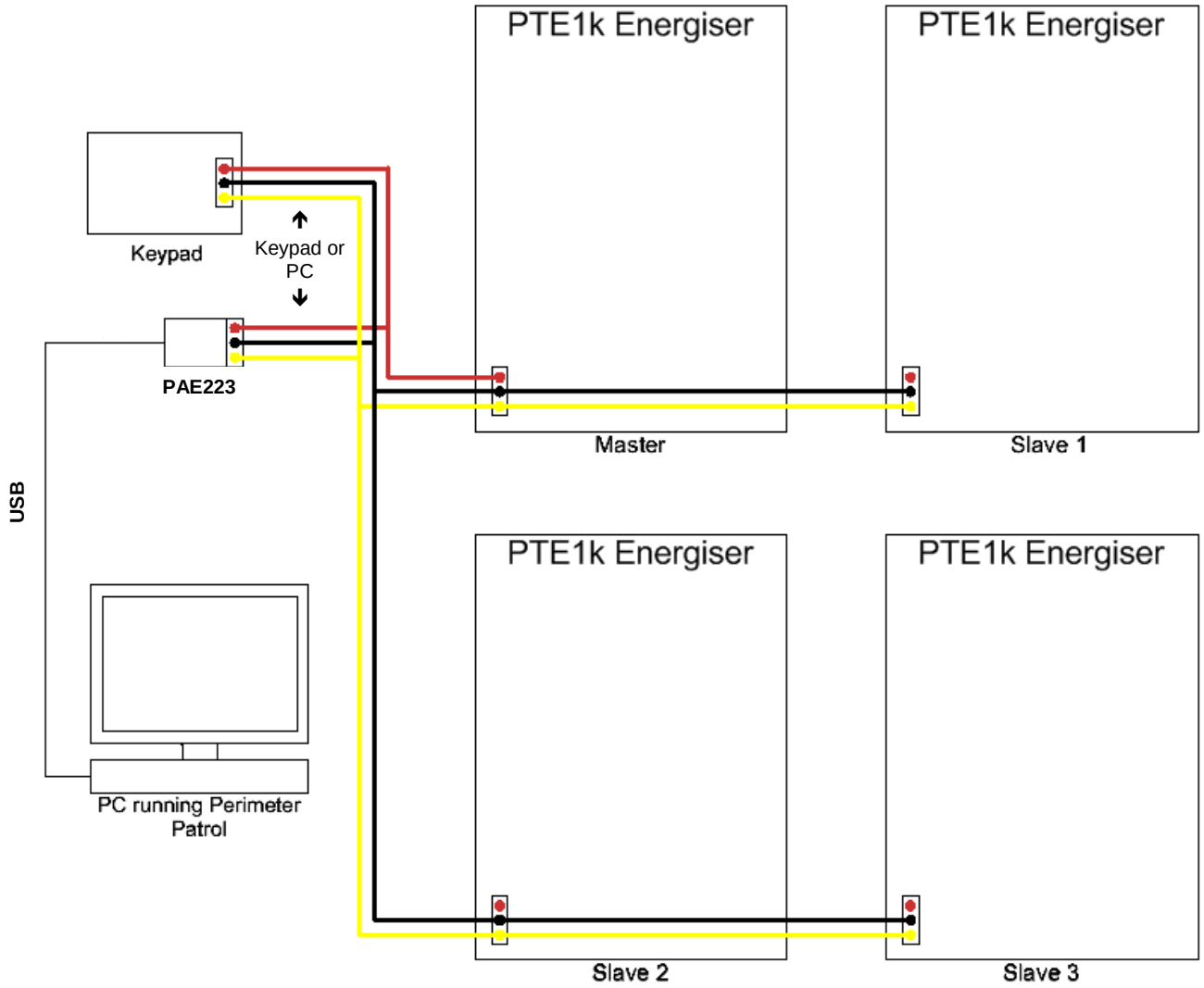


Figure 20 - Group Mode Linking

Note: It is not yet possible to control a group using a keypad and a computer running Perimeter Patrol connected on the same keypad bus. Either a keypad or a PC can be used but not together.

12.2.2 GROUP INSTALLATION NOTES

1. All PAE10xx's need an appropriate high voltage circuit earth connection.
2. Each Energiser must have its own AC supply (charger) and battery.
3. Allow for the heat load of multiple Energisers mounted inside a cabinet, approx. 5W each, 10W if the AC plug pack is also in the enclosure.
4. Use shielded or twisted pair cable for the group keypad wiring.
5. You will need to program the GROUP ID option on each of the Energisers before operating as a group. Do this by connecting a keypad to each Energiser, one at a time, then wait till the slave enables the keypad before programming it.
6. Each slave in the group must have a different number set in option 21. Record the ID on the Energiser. PAE102x dual Zone Energisers count as 2 slaves. I.e. if the Energiser is Slave 2 then Zone 1 is Slave 2 and Zone 2 is Slave 3.

Group Mode Limitations Using Category 5 Cable:

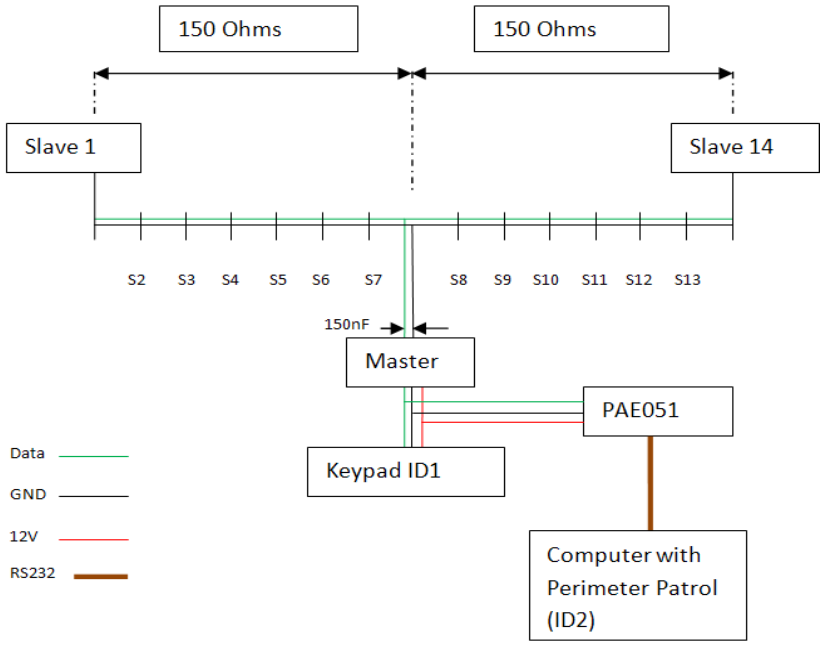
- For best results, the Master should be connected closest to the control/monitoring unit (Keypad, computer or LCD display). Note that the keypad can only tolerate 4.5 Ohm resistance on the GND wire from the Master to be able to control more than 15 Energisers in the system. When using CAT 5 cable, 2 or more wires can be shorted together to reduce the cable resistance.

  Note that CAT 5 DC loop resistance is 0.188 Ohm / meter

- We recommend that the maximum length between a single energiser and a control/monitoring unit should be 1km because of the capacitance between wires with CAT 5 cables. CAT5 cable capacitance is 52pF / Meter.

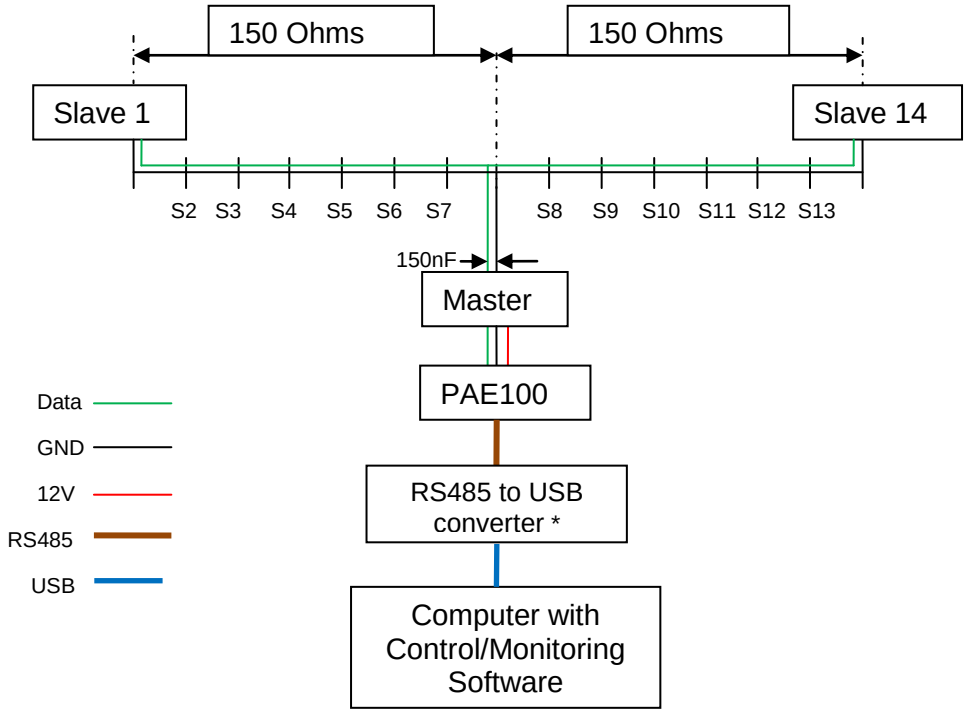
- Using single CAT 5 wire connections, we recommend that the maximum length of cable for 2 energiser and up to 15 should be 1.5Km, and for 3 or more energisers, the Master should be in the centre of the cable and the energisers should be evenly spaced. For big systems, 2 or more CAT 5 wires can be shorted together to decrease the connection resistance between units. Star or Ring Network configurations can also be used. Note that the maximum capacitance acceptable between Data and GND for a 15 Energisers group is 150nF. For a star or ring network configuration it is worth calculating or measuring the capacitance at the Master point of view to make sure it doesn't exceed this value.

Connecting a group of energisers to Perimeter Patrol and keypad:



Note: *S2 = Slave 2; S3 = Slave3 etc...*

Connecting a group of energisers to a computer with USB input:

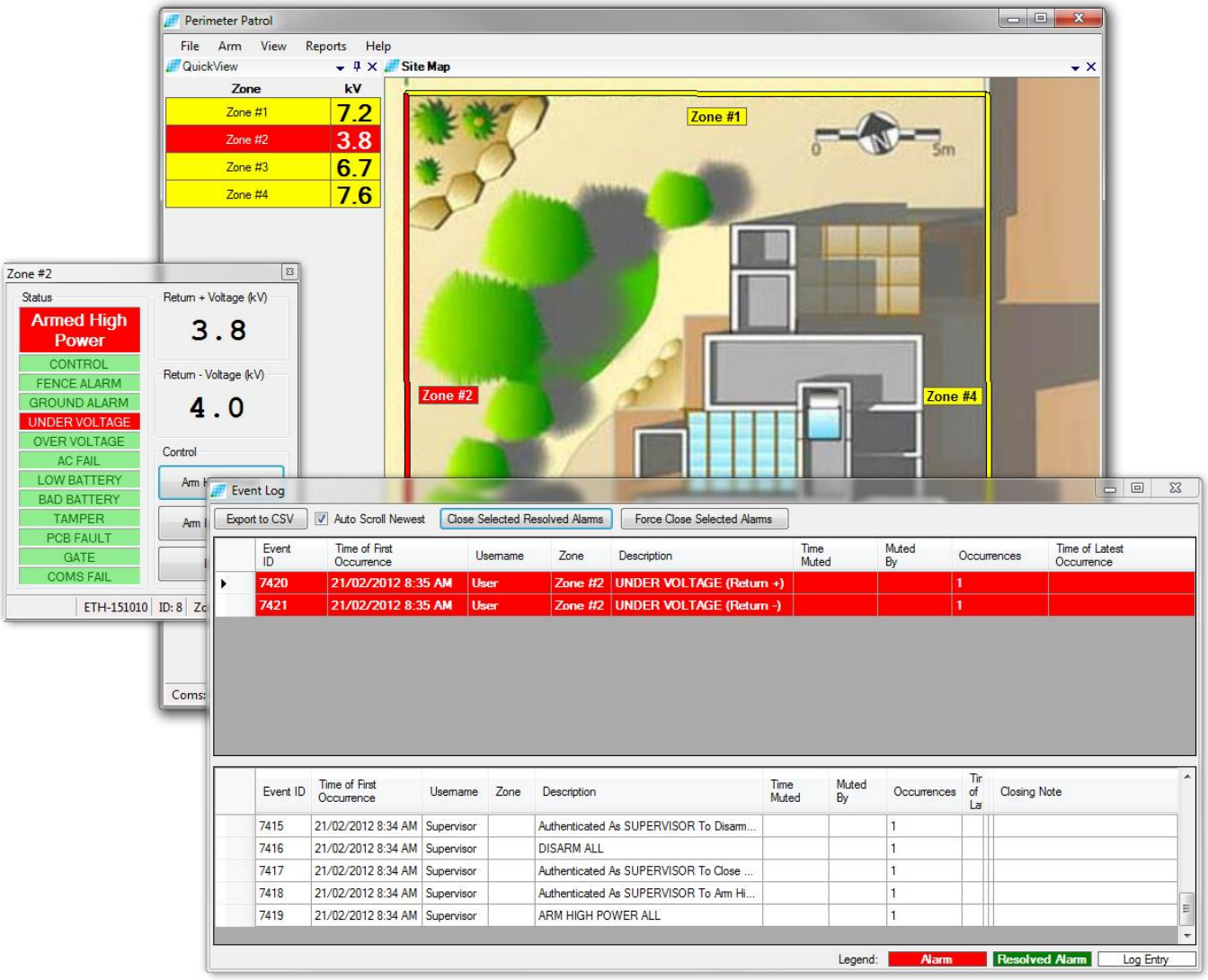


<u>Note:</u> We recommend using 3onedata RS485 to USB converter

13 Appendix B: Perimeter Patrol Software

Perimeter Patrol™ adds PC connectivity, communications and control to your security electric fence, giving you the peace of mind that comes from being able to check that your fence is working wherever you are.

Perimeter Patrol™ runs on a standard Microsoft Windows PC connected to PTE1000 Series Security Electric Fence Energisers via PAE051 (RS232), PAE100 (RS485) or PAE212 (TCP/IP Ethernet) adaptors.



13.1 Perimeter Patrol™ Lite:

The Perimeter Patrol™ Lite software package enables up to four energisers to be monitored and controlled from a PC. It is suited to a home environment.

13.2 Perimeter Patrol™ Pro:

Perimeter Patrol™ Pro provides more functionality than Lite and is required for industrial or commercial installations.

13.3 Version Comparison Table:

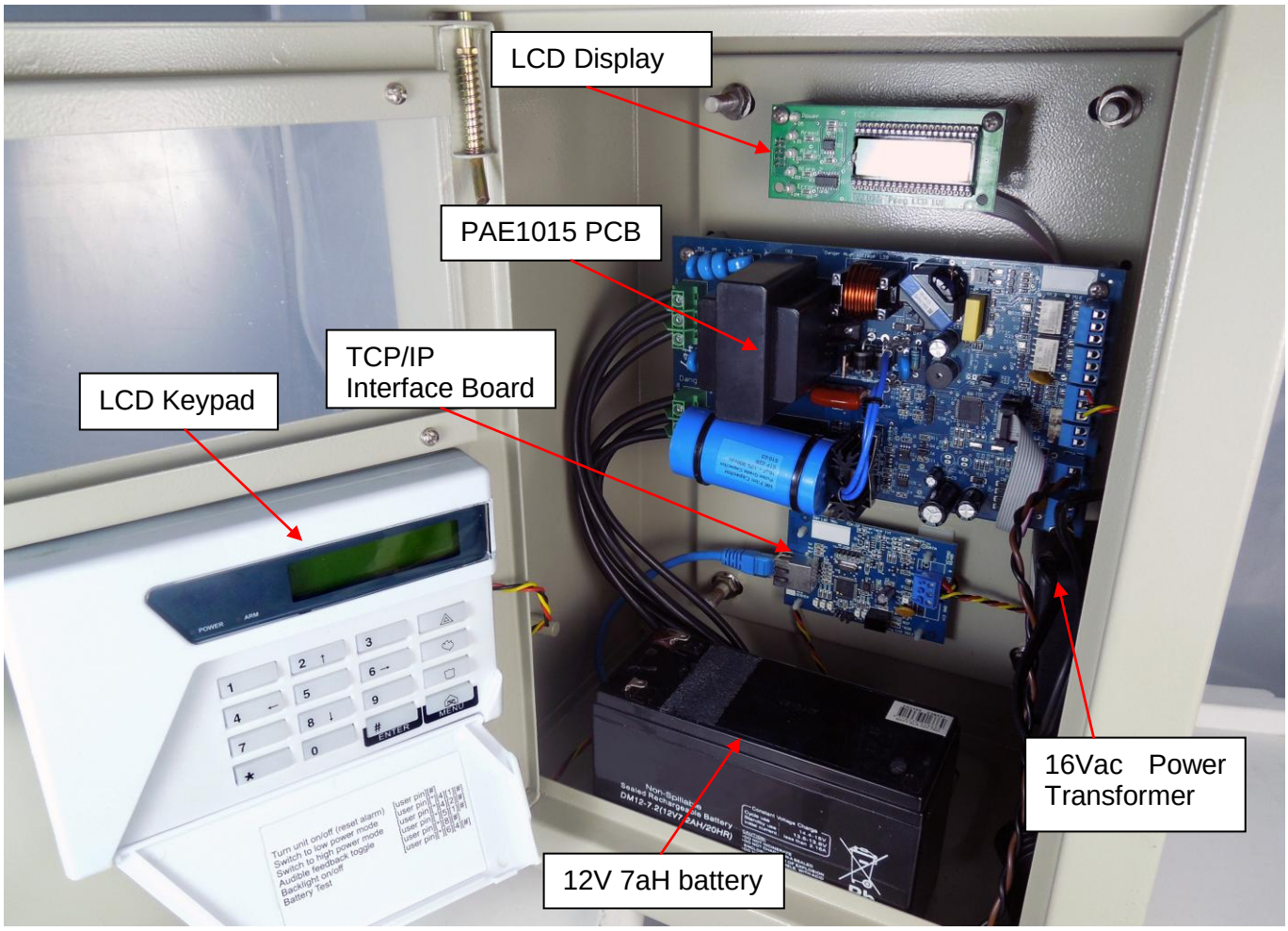
Feature	Lite	Pro
View & Control Energiser Zones	Yes	Yes
Map-Oriented Zone Mimic Screen	Yes	Yes
Automatically Control on Schedule	Yes	Yes
Alarm Display and Sound	Yes	Yes
Email on Alarm	Yes	Yes
Ethernet (TCP/IP) Communication Mode	No	Yes
Serial Communication Mode	Yes	Yes
User Authentication	No	Yes
Full Screen Mode Preventing Access to Other Applications	No	Yes
Event Logging with Viewer and Automatic Archival	No	Yes
Software Keypad	No	Yes
Administrator's Full System Controller	No	Yes

13.4 Specifications:

Operating System		Microsoft Windows 7, Server 2003, Vista, XP
Logging Database (not available in Lite)		Microsoft SQL Server 2008 Express Edition
Communications Interface		TCP/IP or Serial Port
Minimum CPU		Intel or compatible Pentium III 500 MHz or faster processor (1GHz or faster recommended)
Minimum RAM		1GB recommended on Windows XP 2GB recommended on Windows 7, Vista, Server 2003
Scheduled Control	Repeats	Weekly
	Granularity	30 Minutes
Email Support		SMTP, SSL, Authentication
Maximum Number of Zones	Lite	4
	Pro	250 (limit dependent on system configuration)
User Levels (not available in Lite)	User	View Zone Voltages and Alarms
	Supervisor	*All User Tasks Above* Control Energisers Close Resolved Alarms Exit Full Screen Mode
	Administrator	*All User and Supervisor Tasks Above* Modify System Configuration
Integration of Legacy Equipment		Via contact inputs and relay outputs

14 Appendix C: A field enclosure reference design for PAE1015 and PAE1020

14.1 A field enclosure reference design for PAE1015:



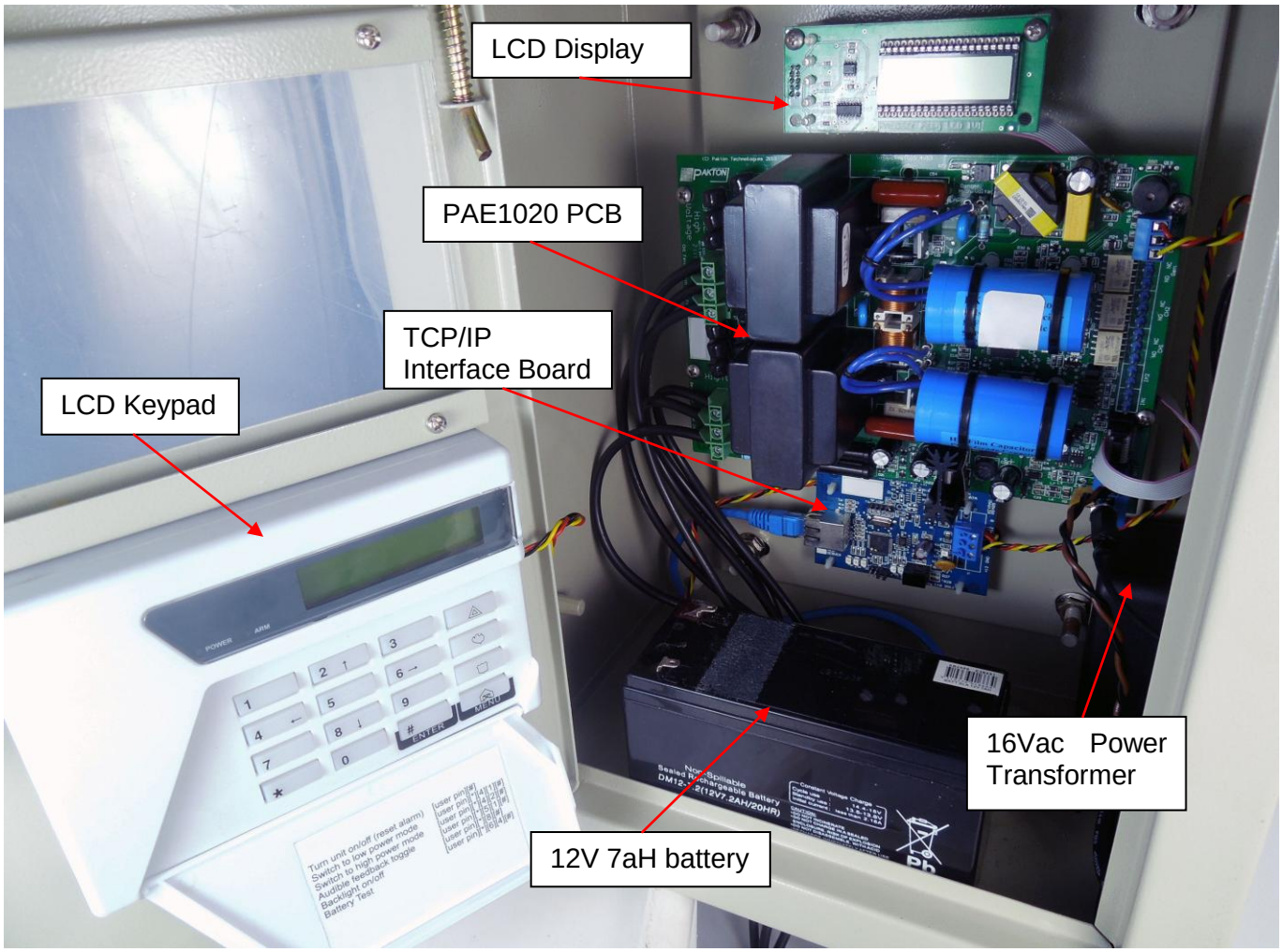
Field Enclosure

For the final product to meet safety standards the following assembly rules need to be adhered to.

- If the PCB is mounted in a metal enclosure (as opposed to plastic) the PCB must be mounted on plastic standoffs of at least 30mm long.
- No metal parts in the enclosure should be allowed to come within 25mm of the high voltage end of the PCB.
- Low voltage wiring such as those to the LCD, relays and inputs, must not come within 25mm of the high voltage end of the PCB.
- High voltage wiring should exit the enclosure without coming within 25mm of any low voltage wiring.
- Do not mount the field enclosure in direct sun, for example on a north or west facing wall. If the field enclosure has to be mounted in the sun consider adding a sun shield over the top.
- Consider whether the enclosure needs to be heated to keep the internal temperature from falling below -20C.

For more information please contact sales@pakton.com.au

14.2 A field enclosure reference design for PAE1020:



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For more information please contact sales@pakton.com.au

15 APPENDIX C: Version Tables

15.1 PCB's (Including minor "schematic only" revisions)

15.1.1 PAE101x

Version	Release Date	Batch or Sno.	Changes
5V51	Jun 08		Main PIC to SMD. New code and options tables
5V52	May 09	Batch#57	Improvements for mass production Improvement made to Opto feedback circuit to avoid cross coupling. R40 added to avoid shorts between TX and 12v on expansion connector. D10 changed to Shottky diode.
5V53	Dec 09	Batch#60	Keypad circuit modified to allow a group to keep on working when one Energiser is powered down or faulty.
5V55	Feb 2011		Small changes to improve manufacturability
5v56	May 2012	Batch #65	Removed Tamper circuit. D52, D53, L29, and Q15 changed to allow unit to become a High Power unit by replacing the 30uF Capacitor and running Firmware 7v76.3.

15.1.2 PAE102x

Version	Release Date	Batch or Sno.	Changes
4V3		Sn46618	This version needs some modification to work with 238LCD keypad. (Serial number older than Sn57499)
4V51	December 09		Improved battery charger circuit with reverse battery protection. All Surface mount components moved to top side. Relays, opto-isolators, LED's to SMD as per PTE1k5V51 Keypad circuit now similar to the one used on PTE1k5V53 allowing a group to keep on working when one Energiser is powered down or faulty. Relay drivers replaced to bi-polar transistors LCL's replaced to Chip ferrites Calibration trimmers removed (now calibration done in software). Glass fuses replaced to Poly switches Unused mount points and scallops removed D47, D9 and D47 replaced to surface mount PIC replaced to 16F887 (with crystal option) All transistors and mosfets changed to SMD Main caps replaced with flying leads ones Plating through and pads removed from mounting holes, including for Transformers and main capacitors. Output terminals changed to the latest component, ability to fit white connector as well. Latest DC/DC transformer used (1 pin removed)

			Improvement made to Opto feedback circuit to avoid cross coupling. Resistor R30 added to protect TX from expansion board 12V short Test points for Automatic test
4V52	June 2010		C29 moved down from Q5 to give space for screw driver (To screw Q5 to heat sink) J3 and J4 moved further apart to facilitate fitting Charge Mosfet changed to Logic level to avoid overheating with increased power F2 AC polyswitch changed to 2.5A to cope with extra power W04 AC bridge to replace D5-D8 to cope better with extra power D52,D20 changed to P600M (6A) C52 moved from out of the way of the 30uF capacitors. D19 Changed to S3M diode (3A) to allow for more power
4V53	August 2010		GND plane removed from underneath D19 to avoid shorts
4V53.1	June 2012		Removed Tamper Circuit.

15.2 Firmware

15.2.1 ALL MODELS

Version	Release Date	Changes
5V30	2005	V4 added cross coupled alarm. This version only works with LED keypads.
7V61 from 7V59	Jan 2009	Beeper now works as in previous PCB version. Model and Customer number added at start-up.
7V76	Dec 2009	Bad battery is reset every 5 minutes Keypad bus now supports two keypads Keypad search has been sped up: The LED keypad is now polled first (Address 8), this should fix the problem whereby a keypad takes some time to be recognized. Stopped slaves from sending status if there is no master Auto reduction in output power when destructively high return voltages are detected Default fence power reduced to 6 (was 9) Added model and customer numbers at start up Fixed a bug which caused zones to think they were still active after they were disarmed Added ability for 2 Zone Energisers to independently control on / off for Zone 2 via input 2. Set option 12 to 2. Added Reset (to view firmware version) from PIN *68# Keypad now shows group alarms zones 1 to 8. Added Voltage limiting, replaces auto power reduction. Added Power Boost from keypad *99# Added Siren and strobe test from keypad *63# Added battery test, displays battery V on LCD *64# Shorter beep on start-up Addressed issue whereby a bad main capacitor could cause the failure

		of Q14: as soon as the Energiser sees that the capacitor is not charging it will stop and alarm with error 4. Fixed the bug whereby ID 2 could not be used. Added Gates alarm on keypad: Gate 1 =Zone3 and Gate 2=Zone4 Added gate 2 to the CHIME MODE operation Gate alarm added as a relay selection 14 PAE1020: AC alarm now cleared by Switching IN1/IN2 7v76C added option 19 set to 1 for LED KP only.
7V76.2		Removed tamper and J3. Let PAE212 and Keypad can recognise energiser type automatically. Build and check this code for a PAE1015 high power unit. Energiser goes to low power mode on low battery.
7v76.3		Minor update Fixed Bug #2944: Time out for Keypad programming mode Fixed Bug #623: Arm specific Zone ([PIN][*12#]) did not work with the PAE1020 Added Feature #2974: Add reset and return to default Keypad code Added Feature #2929: Ac fail and Battery Alarm set for 5 min Added Feature #2832: Allow capacitors to be interchanged without re-flashing firmware. Code for PAE1015(16) and PAE1015(30) are now the same.
8v08	June 2014	The PAE1015 will now control the output to the selected voltage. More relay functions. Auto Re-arm time changed. Added Binary options.