NEMTEK
GROUP OF COMPANIES

MERLIN 4 – Electric Fence Energizer

INSTALLER MANUAL

E-MER4

I N T R O D U C T I O N

The MERLIN 4 is a battery (12V 7AH nominal) operated energizer suitable for connection to mains (230V 50Hz nominal).

The batteries to be used are rechargeable lead-acid batteries. Non-rechargeable batteries must NOT be used. The lead-acid batteries require venting and it is imperative that the energizer be situated in a well-ventilated area.

D I S C L A I M E R

NEMTEK Holdings (Pty) Ltd or any of its subsidiary companies does not guarantee that the operation of the product will be uninterrupted or totally error free.

Energizer specifications may be altered without prior notification.

The installer is referred to the definitions and general requirements in Appendix A.

The installer must take into consideration the applicable municipal laws concerning the installation of electric fences. General guidelines are available, or refer to the website: http://www.nemtek.com. International standards can be viewed at http://www.iec.ch and South African standards on http://www.sabs.co.za.

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MANUFACTURED IN SOUTH AFRICA

GUARANTEE

The MERLIN 4 energizer, manufactured by IO Tech Manufacturing (Pty) Ltd, is guaranteed for a period of one year from date of sale against defects due to faulty workmanship or materials.

IO Tech Manufacturing (Pty) Ltd will, at its discretion, either repair or replace a product that proves to be defective.

IO Tech Manufacturing (Pty) Ltd guarantees the product, when properly installed and used in line with the specification as determined by IO Tech Manufacturing (Pty) Ltd from time to time, will execute its function of generating a suitable potential. IO Tech Manufacturing (Pty) Ltd does not guarantee that the operation of the product will be uninterrupted and totally error free. Faulty units must be returned to Nemtek, Units 4 & 5, 64 Vervoer Street, Kya Sand, Randburg, Gauteng, South Africa OR Nemtek Security Warehouse, Unit 4, Meadowdale Park, Cnr. Herman & Dick Kemp Roads, Meadowdale, Edenvale, Gauteng, South Africa. Buyer shall pay all shipping and other charges for the return of the product to Nemtek or Nemtek Security Warehouse.

LIMITATION OF GUARANTEE

The guarantee does NOT apply to defects resulting from acts of GOD, modifications made by the buyer or any third party, misuse, neglect, abuse, accident and mishandling.

EXCLUSIVE REMEDIES

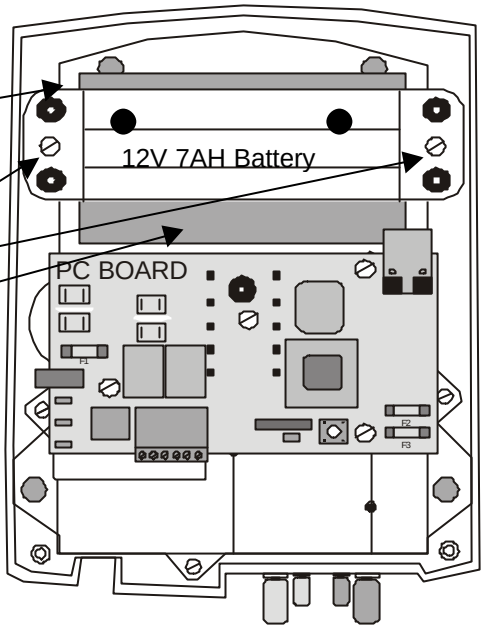
The remedies provided herein are IO Tech's sole liability and buyer's sole and exclusive remedies for breach of guarantee. IO Tech Manufacturing (Pty) Ltd shall not be liable for any special, incidental, consequential, direct or indirect damages, whether based on contact, tort, or any other legal theory. The foregoing guarantee is in lieu of any and all other guarantees, whether expressed, implied, or statutory, including but not limited to warranties of merchantability and suitability for a particular purpose.

*Energizer to be mounted vertically against a flat surface, in well ventilated area.
*Avoid prolonged exposure to direct sunlight

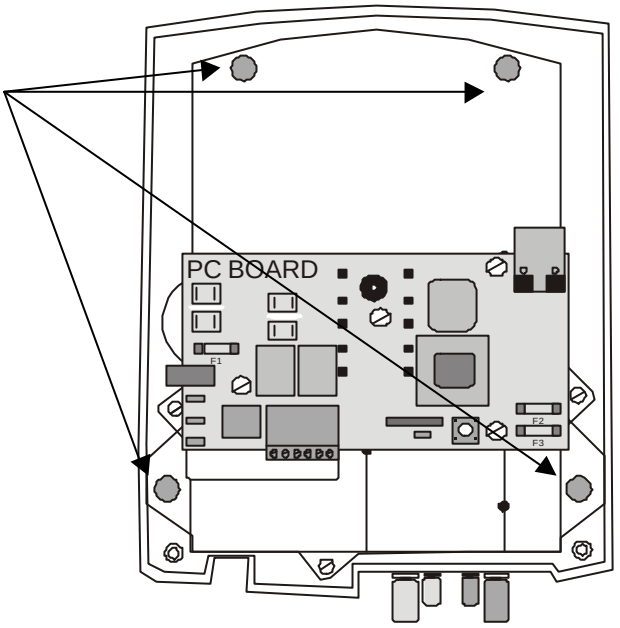
STEP 1: Disconnect mains. Open the lid by removing the two cap screws. Unplug the battery terminals if connected.

STEP 2: Remove screws and battery bracket

STEP 3: Remove battery
**Dispose of old battery according to legal requirements. Do NOT replace with non-rechargeable battery!!*



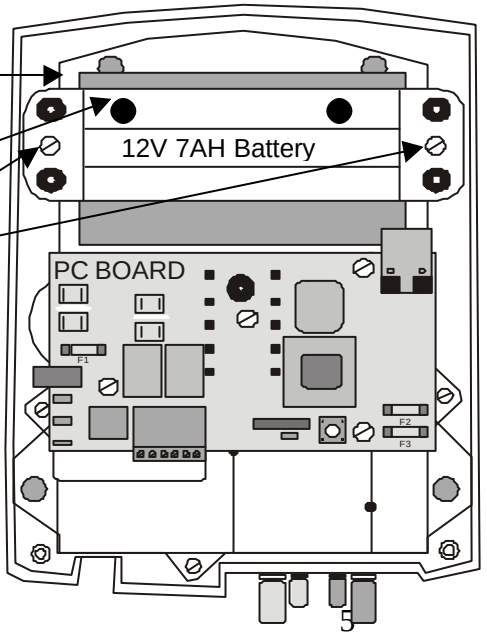
STEP 4: Drill 4 x 8mm holes for mounting the unit. Four nail-in anchors are supplied with the unit. Insert the plastic sleeve of the nail-in anchor from the inside of the box and then hammer the screw in with a screw driver and hammer.
NB: Always insert the plastic sleeve from the inside of the box.



STEP 5: Insert battery with the positive terminal to the top.

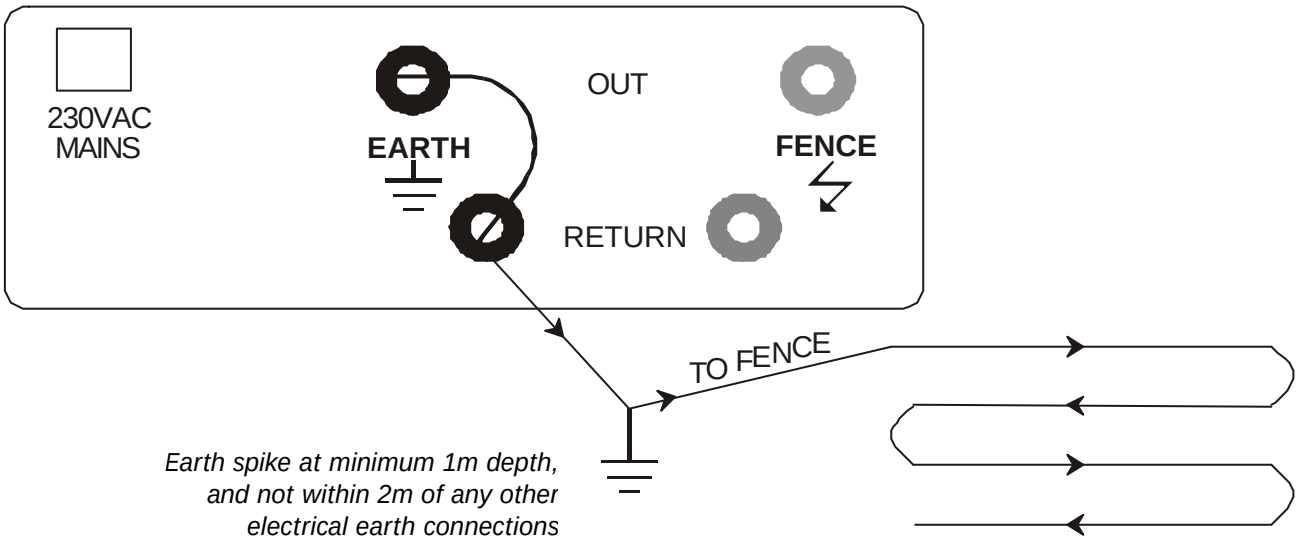
STEP 6: Place the battery bracket back (with plastic offsets at the top) and fasten the screws.

STEP 7: Connect battery wires. Close the lid by hooking the top of the lid in first and then fasten the bottom down with the two cap screws. Apply mains to the unit.



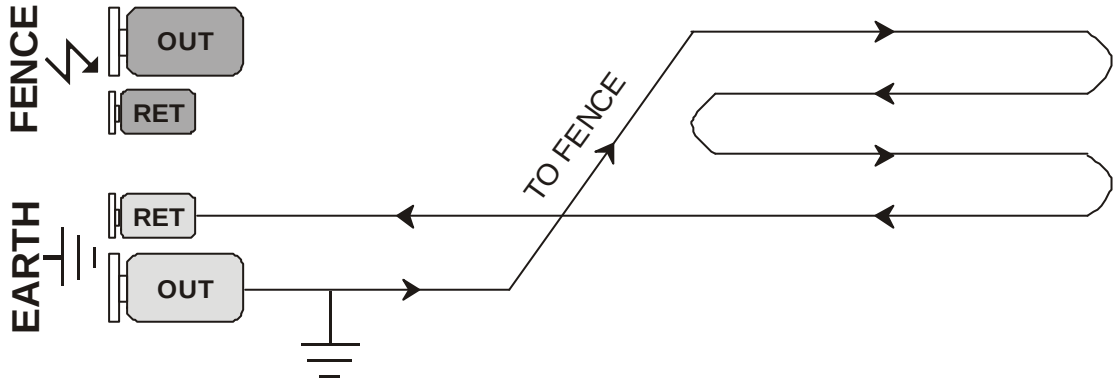
OPTION 1: NO EARTH LOOP MONITORING

Bridge the earth OUT to earth RETURN. The unit will now function as per the old version WIZORD.

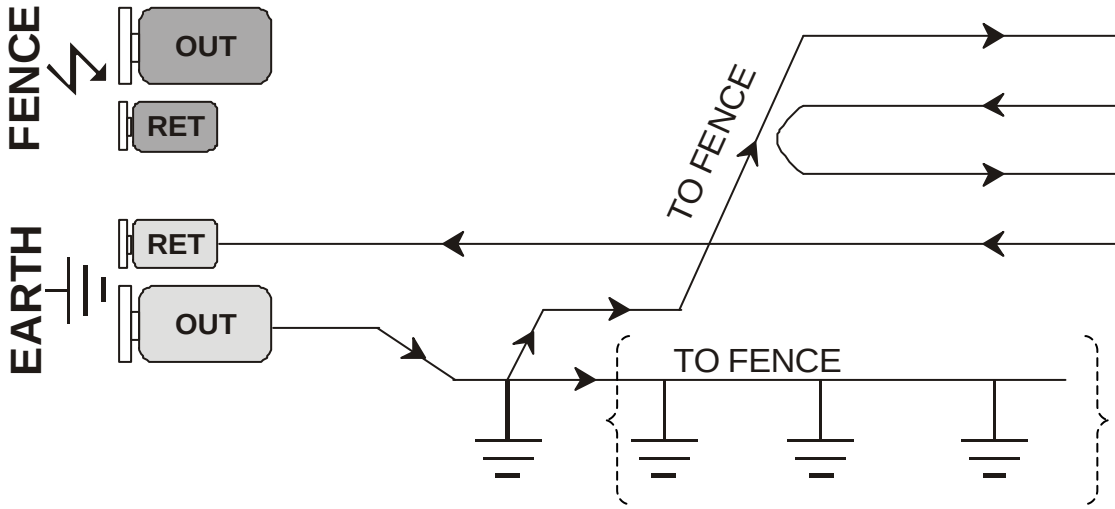


Earth spike at minimum 1m depth, and not within 2m of any other electrical earth connections

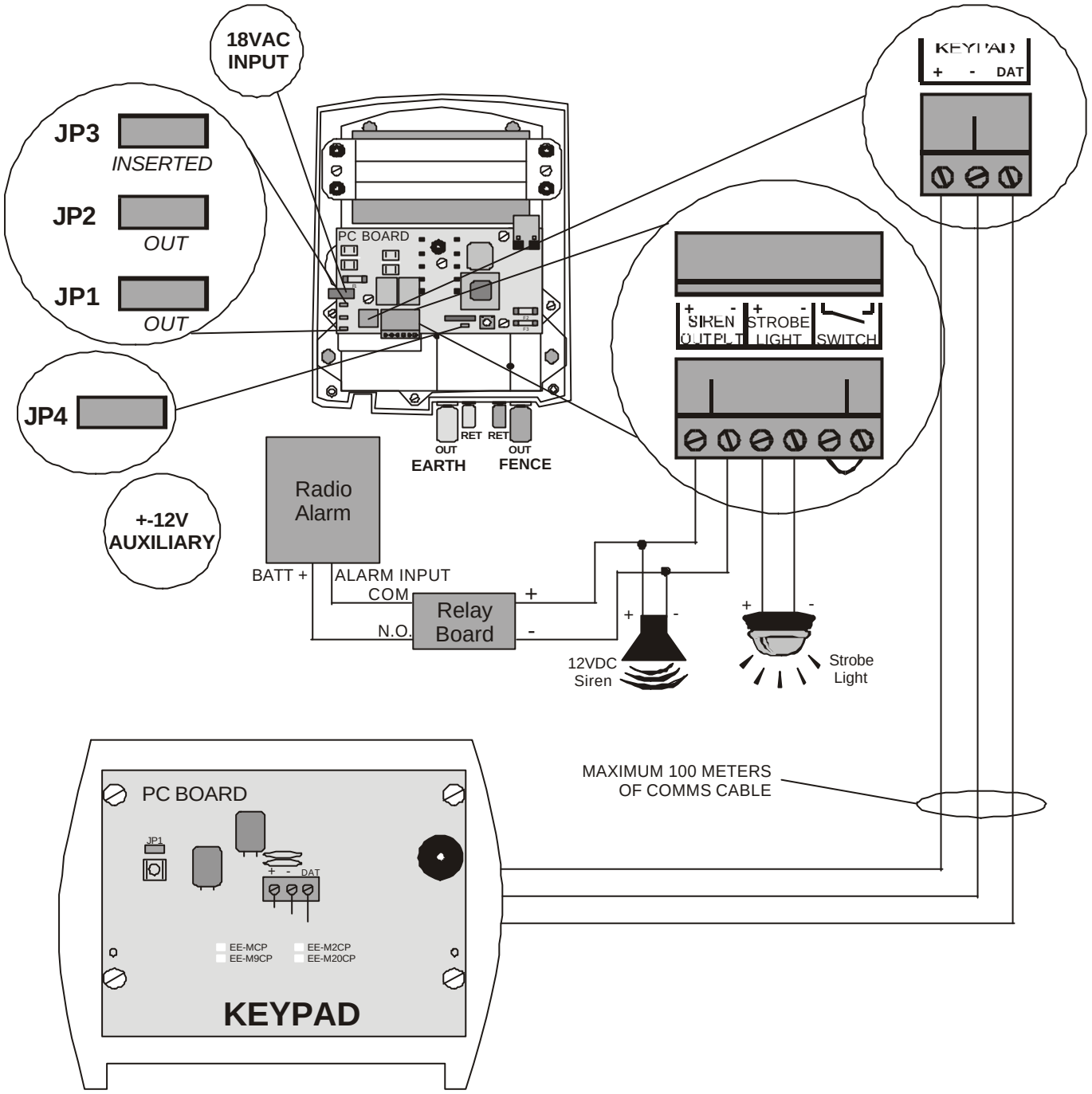
OPTION 2: EARTH LOOP MONITORING; GOOD SOIL EARTHING



OPTION 3: EARTH LOOP MONITORING; POOR SOIL EARTHING



This earth wire is not coupled to the fence earth at any other point



JUMPER OPERATION:

The following jumper settings **must** be used:

* **JP1** – removed
* **JP2** – removed
* **JP3** – inserted
* **JP4** – removed

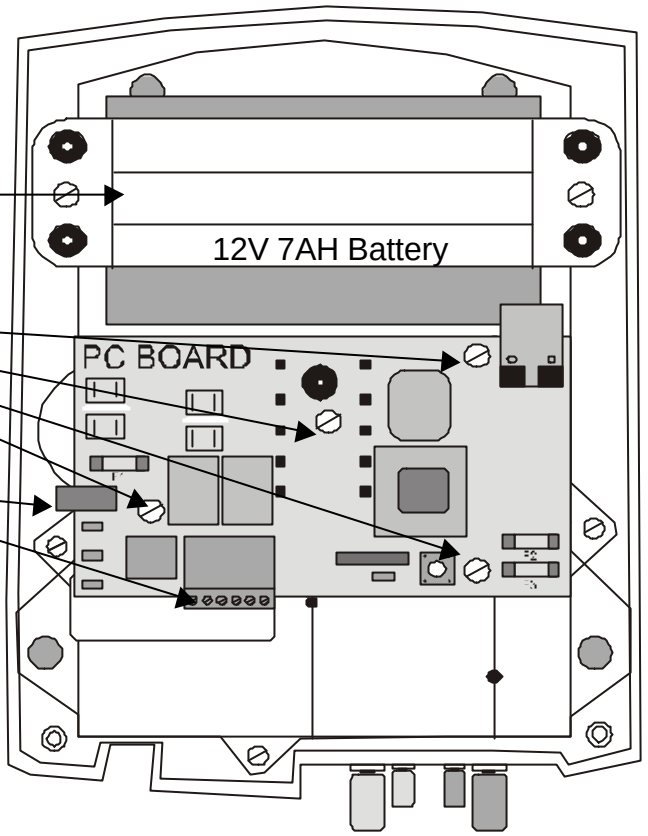
REMOVAL:

STEP 1: Disconnect mains and battery terminals if connected

STEP 2: Remove screws

STEP 3: Remove all connectors from PC Board

STEP 4: Gently pull PC Board straight up to remove (connections on the back)



REPLACEMENT:

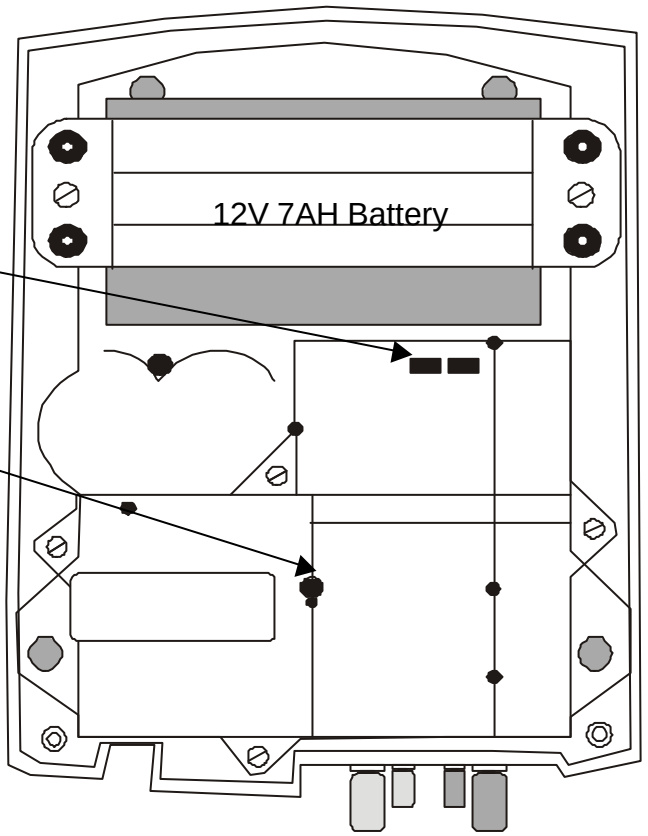
STEP 5: Gently push PC Board back into place

Take care that the spade connectors are correctly positioned before pushing the PC Board into place.

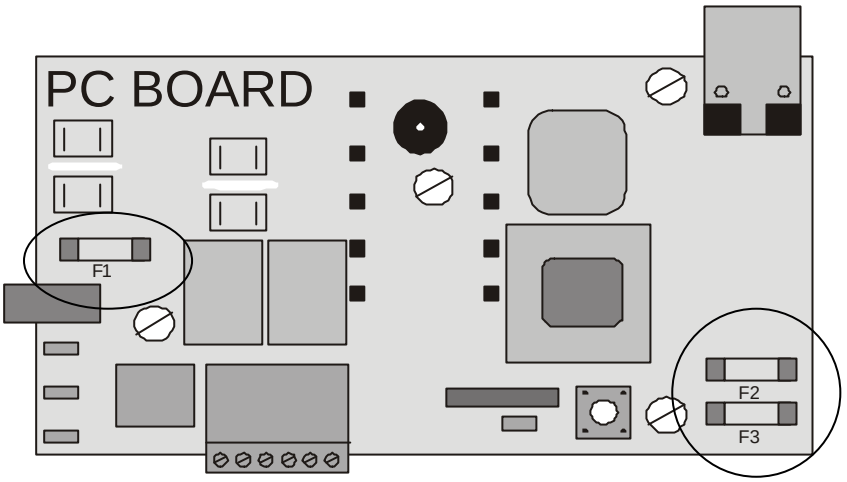
Also ensure that the opto-coupler (looks like LED) is correctly positioned before pushing the PC Board into place

STEP 6: Reconnect all connectors to PC Board

STEP 7: Reconnect battery terminals



FUSE DESCRIPTION & FAULT SYMPTOMS



HOW TO CHECK: (ALL FUSES ARE 2 AMPERE FAST BLOW)

F1: Energizer does not operate when mains is switched off

F2: Siren or strobe light does not operate (ensure that the unit was switched off with no fault conditions)

F3: Power light is not lit, even when mains is present

INSTALLATION NOTES:

1. Keep the wires to the fence **separate** from the keypad/gate/siren/strobe/ mains/remote wiring.
2. Do **not try and modify the unit.** Any unauthorised modifications will null and void the warranty and possibly make the unit illegal.
3. If the **remote On/Off** facility is used, the wire between the remote switch and the energiser can be up to a 100m. The switch contact must be closed for the energiser to be on. For security reasons it is better to use an intelligent FOB on the keypad bus.
4. A **remote receiver** can obtain **12VDC** from the keypad bus. Current consumption must not exceed 0.1 Amps. This **is not sufficient to supply power** for an armed response transmitter.
5. The **siren** and **strobe light** together must not draw more than 1.75Amps.
6. To connect a **radio alarm transmitter** or **alarm panel** to the energiser use an isolation relay between the strobe light output and the panel. Never use the energiser battery to power a radio alarm transmitter or alarm panel.
7. The wire between the **magnetic gate switch** and the energiser can be up to a 100m but must not run in parallel with the fence wires. The gate switch must be open circuit if the gate is open.
8. The **remote keypad cable** must not exceed a 100m in total. Avoid running this cable in parallel with any fence (high voltage) wires.
9. You can connect a total of four keypads or FOB units to one energiser. Each must have a unique address setting.
10. Use **high voltage insulation wire** between the fence and energiser, including the earth wire. Never run these wires in the same conduit or through the same hole as the low voltage wiring.
11. Always use ferrules or line clamps to connect two **high voltage wires** together. Avoid using different types of material for connections like copper on steel.
12. The **fence** must be **earthed** properly with at least one earth electrode as close as possible to the energiser. The distance between the fence earth electrode and other earth systems shall be not less than 10 m.
13. When **replacing** the **lid** of the energiser hook the top in first while holding it an angle and then push it closed at the bottom. Fasten the lid down with the two cap screws.
14. Always **test** the **fence** alarm for a short and open-circuit after installation at the furthest point on the fence.
15. Do not use the energiser with **Non-rechargeable** batteries and any lead-acid batteries must be placed in a well-ventilated area during charging.
16. The unit contains a sealed lead-acid battery that will vent to the atmosphere under certain conditions. For this reason it is imperative that the energiser be installed in a well ventilated area.
17. Refer to the applicable laws concerning the installation of electric fences.

ENTER PROGRAMMING MODE

Before any of the installer options can be changed, the unit must be in programming mode. To do so, enter the 6 digit installer PIN followed by the *** 0 #** keys.

- The keypad will beep twice if the PIN was correct. The unit is now in programming mode.
- If no key is pressed for one minute, the system will automatically exit the programming mode.
- The default installer PIN is **0 1 2 3 4 5**

EXIT PROGRAMMING MODE

When finished it is important to exit the programming mode. While in programming mode, you will be unable to access any user functions from the keypad.

INSTALLER PIN

The default installer PIN can be changed by pressing the **0** key twice, followed by the new PIN and the **#** key.

- The new PIN must be 6 digits long.
- If you cannot remember the PIN, default the unit and use **0 1 2 3 4 5** as the PIN.

SIREN-ON TIME

The time that the siren will be on for, can be changed by pressing the **0** key, followed by the **1** key. Select the desired time from the table and press the corresponding number from **0** to **4** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

Example: To change the Siren-On Time to 4 minutes, enter **0 1 4 #**

The default Siren-On Time is **4 minutes**.

0	10 Sec
1	30 Sec
2	1 Min
3	2 Min
4	**4 Min**

SIREN-OFF TIME

The time for the siren to be silent after the Siren-On Time has elapsed, can be changed by pressing the **0** key followed by the **2** key. Select the desired time from the table and press the corresponding number from **0** to **4** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

0	10 Sec
1	30 Sec
2	1 Min
3	2 Min
4	**4 Min**

Example: To change the Siren-Off Time to 2 minutes, enter **0 2 3 #**

The default Siren-Off Time is **4 minutes**.

NUMBER OF TIMES THE SIREN SOUNDS

The number of times the siren will sound after an alarm is activated, can be changed by pressing the **0** key, followed by the **3** key. Select the desired number of times from the table and press the corresponding number from **0** to **4** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

0	Once
1	Twice
2	**3 Times**
3	6 Times
4	10 Times

Example: To change the Number of Times The Siren Sounds to 10 times, enter **0 3 4 #**

The default Number of Times The Siren Sounds is **3 times**.

GATE DELAY TIME

The time delay for the gate to stay open before the alarm is activated, can be changed by pressing the 0 key, followed by the 4 key. Select the desired time delay from the table and press the corresponding number from 0 to 4 followed by the # key. The keypad will beep twice to indicate that the new setting was accepted.

0	15 Sec
1	30 Sec
2	1 Min
3	2 Min
4	**4 Min**

Example: To change the Gate Delay Time to 30 seconds, enter 0 4 1 #

The default Gate Delay Time is **4 minutes**.

HIGH POWER FENCE VOLTAGE

The open circuit fence voltage can be changed by pressing the **0** key, followed by the **5** key. Select the desired voltage from the table and press the corresponding number from **0** to **4** followed by the **#** key.

The keypad will beep twice to indicate that the setting was accepted.

Example: To change the Fence Voltage to 6 kV, enter **0 5 3 #**

0	3.0 kV
1	4.0 kV
2	5.0 kV
3	6.0 kV
4	**7.0 kV**

The default Fence Voltage is **7 kV**.

The energizer will only use the High Power Fence Voltage parameter when mains is present. The energizer has a unique algorithm for extending battery life during mains failure conditions and automatically controls the fence voltage.

LOW POWER FENCE VOLTAGE

The open circuit low power fence voltage can be changed by pressing the **0** key, followed by the **6** key. Select the desired voltage from the table and press the corresponding number from **0** to **4** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

Example: To change the Low Power Fence Voltage to 1900 Volts, enter **0 6 4 #**

0	1500 V
1	1600 V
2	**1700 V**
3	1800 V
4	1900 V

The default Low Power Fence Voltage is **1700 Volts**.

STROBE LIGHT FUNCTION

The strobe light output can be changed by pressing the 1 key followed by the 0 key. Select the desired function from the table and press the corresponding number from 0 to 1 followed by the # key. The kepad will beep twice to indicate that the new setting was accepted.

Example: To change the Strobe Light Function so that the strobe light switches on whenever the fence is on, enter 1 0 1 #

0	**Strobe light = Alarm**
1	Strobe light = fence ON

The default Strobe Light Function is option 0. The strobe light switches on when the alarm is activated.

MAGNETIC SWITCH ENABLE

The magnetic On/Off switch (under the facia of the energizer) can be enabled by pressing the **1** key, followed by the **0** key. Select the desired state from the table and press the corresponding number from **2** to **3** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

2	**Magnetic switch disabled**
3	Magnetic switch enabled

Example: To enable the magnetic On/Off switch, enter **1 0 3 #**

By default the Magnetic switch is **disabled**.

SWITCH FUNCTION (6 WAY TERMINAL STRIP)

The switch input, marked as 'switch' on the printed circuit board under the removable 6-way green connector block, can be configured as a timed input (typically used for monitoring a gate) or as a remote On/Off input. The switch function can be changed by pressing the **1** key, followed by the **0** key. Select the desired state from the table and press the corresponding number from **4** to **5** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

4	**Timed switch input**
5	Remote On/Off input

Example: To enable the remote On/Off, enter **1 0 5 #**

By default the switch is a **timed input**.

KEYPAD DETECT FUNCTION

The energizer can be configured to detect if one or more keypads is present. The keypad detect function can be altered by pressing the **1** key, followed by the **0** key. Select the desired state from the table and press the corresponding number from **6** to **7** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

6	Keypad detect on
7	**Keypad detect off**

Example: To enable the keypad detect function, enter **1 0 6 #** (detection period is 15 seconds)

By default the Keypad detect is **off**.

FENCE ALARM DELAY

The energizer fence alarm delay can be altered. The fence alarm delay can be altered by pressing the **1** key, followed by the **0** key. Select the desired state from the table and press the corresponding number from **8** to **9** followed by the **#** key. The keypad will beep twice to indicate that the new setting was accepted.

8	**3 Pulse count**
9	1 Pulse count

Example: To make the fence alarm delay on pulse, enter **1 0 9 #**

By default the fence return voltage must not be present for **three pulses**. **Note that during mains failure and initial turn On, the energizer automatically uses a 3-pulse count delay.**

PROGRAMMING NOTES

1. To load **factory default settings**: Unplug the energizer from the mains and disconnect one of the battery terminals. Reconnect the battery terminal and apply mains to the energizer. Within 38 seconds of reconnecting the battery terminal, the key sequence
   2 3 8 9 # must be entered on the keypad. The energizer will turn off if the default parameters were accepted.

2. After changing the **Fence Alarm Voltage** setting, make sure that a short and open circuit fault can still activate the alarm.

3. The Fence Voltage setting is measured with no load on the energizer. It is possible that the output voltage is lower or higher than indicated in the table if a fence is connected to the energizer.

FAULT FINDING

General fault conditions:

Condition	Power	On	Service	Siren	Comment
Normal	On	On	Off	Off	Normal no fault
Power Failure	Off	On	Off	Off	Check if charger is plugged in
Battery Low	Off	On	Pulse (5 sec)	Offf	Check charger and fuses
Battery Flat	Off		Flash	On	Check charger and fuses
Low Voltage	On	Flash	Off	Off	Fence in low voltage mode
Service			Flash	On	Service fault see next table

Service fault conditions:
There are 5 possible conditions that can cause a service alarm. To determine the cause of the service alarm, open the lid of the energizer box while the service light is flashing. Make sure that Jumper 4 (JP4) is NOT inserted. The following lights will indicate the cause of the service condition:

Condition	LEDS RHS (fence terminals at bottom)	Comments
Comms failure	Closest battery	Only if keypad detect enabled
Fence interference		Mains pickup, second energizer connected
Over temperature		Check battery/replace battery/unit faulty
Energizer faulty		Faulty or tampered with
Battery flat	Bottom energizer	Check fuses/mains/battery

COMPLIANCE WITH INTERNATIONAL STANDARDS

The Merlin 4 Energizer has been designed to comply with the latest International safety and environmental standards. The manufacturer, IO Tech Manufacturing (Pty) Ltd., reserves the right to make modifications and alter specifications without prior notice.

Compliance testing in accredited overseas laboratories is in the process of being finalized.

FREQUENTLY ASKED QUESTIONS

Q: Why do the alarm **indicator lights sometimes flash at different rates** and sometimes be lit permanently?

A: A **slow flash** indicates a bypass condition. The respective alarm will not trigger when the energizer is in this state. A **fast flash** indicates that the alarm condition still persists i.e. the service indicator will flash if the battery voltage is still low. A **permanently lit** alarm indicator illustrates that a fault condition was present but is no longer active i.e. mains has been restored and the battery has charged sufficiently that the service indicator is permanently lit.

Q: After the **fence alarm** is activated the fence alarm indicator light does not stop flashing even after repeatedly turning the unit on and off?

A: There is most probably a fault on the fence. Switch the energiser off and disconnect the fence wires at the energizer. Take a short peace of HT wire and bridge the fence-out (Red) and fence-return (Black) terminals. Connect a jumper between the two Green terminals. Switch the energiser back on, if the fence indicates GOOD and the fence alarm indicator is lit continuously then the energiser is working correctly and the fault is on the fence.

Q: After the energizer lid is opened I cannot turn the energizer **on**?

A: The energiser has a built-in safety switch to avoid electrical shock. If you have to work on the unit while the lid is removed insert jumper 4 (JP4). For use by qualified service personnel only. It is illegal to leave this jumper inserted.

Q: When and for how long will the **siren** sound?

A: The siren will be activated by one of the following conditions: Fence Alarm, Gate Alarm, Service Alarm or by holding the Panic button (on the keypad) in for 3 seconds. For a permanent fault like a broken fence wire, the siren will sound for 4 minutes (*Siren-on Time*) or until the user resets the energiser by switching it off and on again. If the energiser is not reset then it will sound the alarm again after 4 minutes (*Siren-off Time*). This siren on-off cycle will repeat itself 3 times (*Number Of Times The Siren Sounds*) after which the siren will not sound unless the fault, i.e. broken wire, is repaired.

Q: Does the electric **fence use a lot of electricity**?

A: No it does not. Typically 10 Watts and 100 hours of usage costs one unit of electricity.

Q: How long will the energizer **run for under mains failure** conditions?

A: If the fence is free from vegetation and the battery is in good condition, typically twenty hours.

BASIC DEFINITIONS:

Electric Fence: a barrier which includes one or more electric conductors, insulated from earth, to which electric pulses are applied by an energiser

Connecting Lead: an electric conductor, used to connect the energiser to the electric fence or the earth electrode

Electric Security Fence: a fence used for security purposes which comprises an electric fence and a physical barrier electrically isolated from the electric fence

Public Access Area: any area where persons are protected from inadvertent contact with pulsed conductors by a physical barrier.

Pulsed Conductors: conductors which are subjected to high voltage pulses by the energiser.

Secure Area: an area where a person is not separated from pulse conductors below 1,5m by a physical barrier.

GENERAL REQUIREMENTS FOR ELECTRIC SECURITY FENCES:

Electric fences shall be installed and operated so that they cause no electrical hazard to persons, animals or their surroundings.

Electric fence constructions which are likely to lead to the entanglement of animals or persons shall be avoided.

An electric fence shall not be supplied from two different energizers or from independent fence circuits of the same energiser.

For any two different electric fences, each supplied from a different energiser independently timed, the distance between the wires of the two electric fences shall be at least 2m. If this gap is to be closed, this shall be effected by means of electrically non-conductive material or an isolated metal barrier.

Barbed wire or razor wire shall not be electrified by an energiser.

Any part of an electric fence which is installed along a public road or pathway shall be identified at frequent intervals by prominently placed warning signs securely fastened to the fence posts or firmly clamped to the fence wires. The size of the warning signs shall be at least 100mm x 200mm. The background colour of both sides of the warning plate shall be yellow. The inscription on the plate shall be black . The warning sign shall typically appear as depicted in Figure x. The inscription shall be indelible, inscribed on both sides of the warning plate and have a height of at least 25 mm.

Warning signs shall be placed at

- each gate
- each access point
- intervals not exceeding 10m
- adjacent to each sign relating to chemical hazards for the information of emergency services.

Gates in electric security fences shall be capable of being opened without the person receiving an electric shock.

The energiser earth electrode shall penetrate the ground to a depth of at least 1m. The distance between any electric security fence earth electrode and other earth systems shall not be less than 2m.

Connecting leads that are run inside buildings shall be effectively insulated from the earthed structural parts of the building. This may be achieved by using insulated high voltage cable.

Connecting leads that are run underground shall be run in a conduit of insulating material or else insulated high voltage cable shall be used. Care shall be taken to avoid damage to the connecting leads due to external factors.

Connecting leads shall not be installed in the same conduit as the mains supply wiring, communication cables or data cables.

Connecting leads and electric fence wires shall not cross above overhead power or communication lines.

Mains supply wiring shall not be installed in the same conduit as signalling leads associated with the electric security fence installation.

Crossings with overhead power lines shall be avoided wherever possible. If such a crossing cannot be avoided, it shall be made underneath the power line and as nearly as possible at right angles to it.

If connecting leads and electric fence wires are installed near an overhead power line, the clearances shall not be less than those shown in Table 1.

Power Line Voltage (V)	Clearance(m)
Equal or less than 1 000	3
>1 000 and equal or less than 33 000	4
>33 000	8

Table 1

If connecting leads and electric fence wires are installed near an overhead power line, their height above the ground shall not exceed 3m.

Where an electric security fence passes below bare power line conductors, the highest metallic element shall be effectively earthed for a distance of not less than 5m on either side of the crossing point.

This height applies either side of the orthogonal projection of the outermost conductors of the power line on the ground surface, for a distance of

- 2m for power lines operating at a nominal voltage not exceeding 1 000 V
- 15m for power lines operating at a nominal voltage exceeding 1 000V

Electric security fences and their ancillary equipment shall be installed, operated and maintained in a manner that minimizes danger to persons, and reduces the risk of persons receiving an electric shock unless they attempt to penetrate the physical barrier, or are in a secure area without authority. Exposed conductive parts of the physical barrier shall be effectively earthed.

A spacing of 2.5 m shall be maintained between uninsulated electric fence conductors or uninsulated connecting leads supplied from different energizers. This spacing may be less where conductors or connecting leads are covered by insulating sleeving, or consist of insulated cables, rated to at least 10kV.

This requirement need not apply where the separately energized conductors are separated by a physical barrier, which does not have any openings greater than 50mm.

A vertical separation of not less than 2m shall be maintained between pulsed conductors fed from different energizers.

Ensure that all ancillary equipment connected to the electric security fence circuit provides a degree of isolation between the fence circuit and the supply mains equivalent to that provided by the energiser. Protection from the weather shall be provided from the ancillary equipment unless this equipment is certified by the manufacturer as being suitable for use outdoors, and is of a type with a minimum degree of protection IPX4.