



ZM20 OEM Technical Manual

Version 15, January 2016



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INTRODUCTION

The ZM20 is an advanced security electric fence monitor with the ability to provide the location of a security breach or fault in the monitored electrified fence. The fault location can be reported as being within 1 of up to 20 pre-programmed "Sectors" or as the fault position measured as a percentage of the total fence length. This allows for a targeted response by security personnel through a manned response or by re-positioning of CCTV cameras.

The ZM20 can reduce the cost of traditional multi-zoned security electric fences by providing up to 20 individually reported sectors from one fence energiser / monitor combination. This can represent a dramatic saving over installing individual energisers for each zone.

When coupled with our PC based control software the ZM20 can report the position of a fault which can be visually displayed on a mimic and reported or relayed to other security management systems.

The ZM20 is designed to be coupled with an electric fence energiser to power the security electric fence. Unlike standard security electric fence energisers, the ZM20 feeds the fence from both "ends" which means that if the fence is cut, the voltage is maintained on both sides of the open circuit. It also determines the health of the fence by monitoring the voltage, currents and (therefore power) flowing through the fence. A change in the power flow can indicate that there is a breach/fault somewhere on the fence. At installation time, the ZM20 is 'taught' the location of the sectors by intentionally placing short circuits at each join between the sectors. PTE0063 passive sector dividers can be used to increase the accuracy of the sector isolation.

By using multiple ZM20's and synchronised energisers, more than one fence loop can be monitored in a single installation allowing for vertical zoning and also providing a degree of redundancy.

The ZM20 has many programmable options which can be adjusted using a JVA Z series keypad (PTE0210). By correctly setting the alarm threshold levels it is possible to determine if a fence has been cut or shorted, though only short circuits can be reported by sector or position.

The ZM20 is fully compatible with JVA Perimeter Patrol for mimic display, logging, email and more.

The ZM20 is designed to meet or exceed the relevant parts of international safety standard IEC60335.2.76 by providing complete galvanic isolation between the fence and low voltage circuits.

The ZM20 is part of the JVA Z series of security products.

The relevant part numbers are PAE213 (PCB Module) and PTE0213 (Complete product).

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. Please ask Pakton for the latest version.
- The users / installation manual will be drawn directly from this material (reformatted). Information NOT meant to be included to end users is identified by comment.

This manual relates to:

PCB versions: 1v00 or higher

Firmware version: 1.55 or higher (the firmware version is shown on the LCD on reset)

Current Firmware: 1.61

FEATURES

- Can split a single fence zone into up-to 20 sectors for more accurate response
- Displays which sector is shorted, up-to 20 programmable sectors
- Reports the position of a short on the front panel LCD as a percentage of the total fence length
- Able to be monitored via PC (using Perimeter Patrol software)
- Able to be integrated into third party security management systems at a variety of levels
- Enables the construction of systems from economical Key switch operation to complex PC controlled applications
- Feeds the fence from both ends to increase deterrent and reduce the effects of a cut wire
- User friendly LCD display
- Built into the wall mountable Z series energiser enclosure
- Controlled and Programmed via a JVA keypad with similar codes to the JVA Z series
- Monitors fence voltage and currents to trigger an alarm if either feed current rises or voltage falls (load increases or reduces suddenly)
- Very short sectors can be accurately defined using the PTE0063 passive sector divider
- Powered from a 16Vac or a 12V DC external source
- In built battery charger for a 7aH backup battery, connections also available for alternative larger external battery and charger
- Controls 12V/24V DC supply to the coupled energiser
- Siren and Strobe connection for standalone operation (switched 12V DC)
- 2 control inputs and 3 form-C relays with many programmable functions for low level integration with other systems

Limitations

- The coupled energiser must be compatible with the ZM20. While all JVA energisers are compatible, the MB8, MB12 and MB16 are recommended. If low power monitoring is also required then the Z14 or Z18 may be used.
- Any energiser used with the ZM20 must comply with IEC60335.2.76 electrical safety standard
- Energisers with a negative voltage pulse are not suitable
- The ZM20 supports conventional wiring only (not Bi-Polar)
- The coupled energiser output pulse energy must not exceed 18 Joules
- The minimum recommended impedance of the fence loop should be 100 Ohms. 20 Ohm sector splitters are available for use with short fences or low impedance wiring
- The maximum impedance of the monitored fence loop which can be accurately monitored using the ZM20 is 1000 Ohms
- The ZM20 cannot show faulted sector or position if the energiser is operating in low power mode

Equipment Requirements and Options

Requirements

- An Energiser (JVA MB8 recommended)
- 12V rechargeable backup battery
- 16Vac power adaptor OR external battery charger
- Security electric fence; standards, insulators, wire etc. wired into sectors.

Some of these items may be included with the ZM20.

Options

- 12V Siren and strobe light
- LCD Keypad (PTE0210). Note 1,2
- Sector Dividers (PTE0063). See Using a Sector Divider below
- Windows PC
 - Windows XP or Windows 7
 - PAE051 or PAE100 serial adaptor AND USB to serial adaptor
 - or PAE212 TCP/IP adaptor
 - Perimeter Patrol PC application (ZM20 or Pro version)

Notes

1. While the Keypad is not essential for normal operation, it is always required for programming options and sectors during installation.
2. Up to 3 Keypads may be used on a ZM20, each Keypad must have a unique ID setting.

For more information on these options please see www.jva-fence.com.au

DANGER

There are potentially lethal high voltages inside the ZM20 and JVA Energisers.

The high voltage inside the Energiser may take a long time to discharge. Wait at least 10 minutes after turning off before opening the case.

Before working on the high voltage wiring of an electric fence, it is recommended that the energiser is disarmed and a short circuit is placed from the fence live wires to earth. This is a sensible precaution against the energiser being armed while working on the fence.

Note: The energiser manual must also be provided to the customer as it includes mandatory safety information.

The ZM20 contains patent pending technology, contact JVA for more information.

OPERATION

Status LED Lights

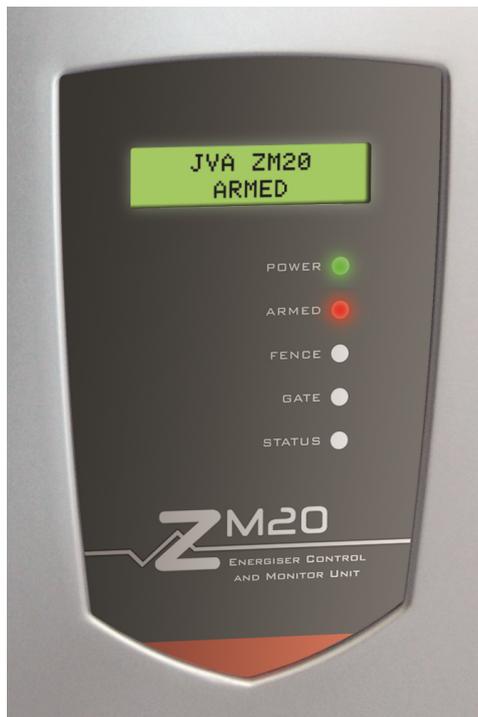
The status LED's on the front of the ZM20 allow the user to quickly ascertain the current status of the unit and if any action needs to be taken. Below is a brief description of each LED (top to bottom) and the information it conveys.

- Power - On whenever the unit has power.
- Armed - On when the unit is armed (pulsing)
- Fence - On when there is a fence alarm (either channel)
- Gate - On when there is a gate alarm
- Status - Flashes an error code for service errors. The LCD may also show an error message.

Status LED Number of Flashes	Interpretation	Corrective \Action
1	Not used	
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 Note: A ZM20 will show this error if disconnected from the Master device (Group ID 1)

LCD display

The Alpha numeric LCD display shows the status of the ZM20 at all times.



ZM20 Screen examples.

JVA ZM20
All clear

JVA ZM20
Disarmed

While armed, the LCD display will cycle the following information every energiser pulse.

Fence 7.8 kV
Ground 0.1 kV

Feed1 2.0A
Feed2 2.0A

JVA ZM20
All clear

Pressing # on the keypad will freeze the current information displayed on the LCD screen for approximately 10 pulses. Pressing the # key again will cycle the display to the next information screen.

This screen shows the fence loop balance.

Sector 10 of 20
Balance 49.90%

When an alarm occurs the screen will detail the type of alarm and the sector if applicable.

ALARM - Short
Sector 3

ALARM
Fence Cut

ALARM
Bridging

ALARM
Gate

ALARM
Ground 1.0kV

ALARM
Energiser Fail

ALARM
Multi-sector

ALARM
Low Voltage

Various "troubles" will also be displayed, such as AC fail or low battery.

Battery 11.5V
AC Fail

When the ZM20 is disarmed, the last alarm will be displayed until cleared.

Disarmed
Alarm Sect 18

The display also shows the programmable options and values when in programming mode.

1 - Alarm V
4.5 kV

Control Options

The ZM20 may be armed and disarmed (controlled) using a:

- Key switch or remote switch connected to the control input (IN1)
- Remote control radio receiver connected to IN1
- Z Series Keypad
- JVA GSM module
- Windows PC running JVA Perimeter Patrol Professional
- Low level interface (wired to control inputs and relay outputs) from a third part security alarm panel or Physical Security Information System (PSIM)

Note: More than 1 method may be used in the one installation.

Control Arbitration

If an installation contains two ways to control the ZM20, then the most recent control signal will determine the Armed/Disarmed state. For example if the ZM20 is armed via the keypad and then disarmed at the control input (IN1), it will disarm.

If connected, the GSM or PC control software may override the control from the input or keypad. If you need to make sure that fence is disarmed (for maintenance) then using the Key switch or keypad alone may not guarantee that the fence will remain disarmed.

Control inputs

The ZM20 may have a single Key switch mounted on the right hand side of the enclosure which can be used to arm and disarm the security electric fence. This switch is useful for the simplest implementations where no keypad or PC control is used. It may be disabled by the installer, by removing the lead from socket J2.

When switched on via the Key switch (or a switch connected to IN1) the ZM20 will power up the energiser it is coupled to and begin monitoring the fence.

The screen will change to display the Armed status and any faults or alarms. If there is a fence fault the ZM20 will go into alarm, the internal beeper will sound (if it has not been inhibited) and any siren and strobe connected to the ZM20 will be turned on.

The sector in which the fault has occurred will be displayed if the ZM20 has been correctly calibrated.

Switching the Key switch off will disarm the ZM20, though it will continue to display the last alarm and sector.

Keypad Control

The ZM20 uses the same keypad as the Z series energisers and is controlled using similar keypad codes. The PTE0210 keypad (Version 2.00 and higher) will display the Fence voltages and currents, plus the sector if in fence alarm.

Alarms and troubles will also be displayed.

The Keypad has two LED lights

Power	On with Mains power, Off with Main fail, flashes on low battery
Armed	On when the energiser is armed, flashes when in low power mode

All other indication is given via messages on the keypad LCD screen.

If the Keypad shows "Alarm" or "Trouble" pressing [#] will reveal more information about the problem.



Arming/Disarming the Fence Using the Keypad

Default User PIN: 1234

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 #.

See also the section on [programming Keypads](#).

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.

When an Alarm Occurs

An Alarm will occur if there is a fault on the fence caused by a short or an open circuit (cut) while the system is armed. The siren will sound and the strobe will light. The internal beeper and the Keypad may also sound, depending on how your system is configured.

There are 7 ways the ZM20 can detect a fence fault:

- 1) The energiser fails to fire at all (Energiser Fail)
- 2) Fence voltage falls (Low Voltage – see option 1)
- 3) Fence currents rise (Fence Short – option 2)
- 4) Fence currents rise and then the position moves (Fence Multi-sector Short)
- 5) The ground voltage rises (Ground alarm – option 3)
- 6) Fence current balance is disturbed without a short (Fence Cut – option 4)
- 7) Fence currents rise or fall but do not trigger a Short or Cut (Anti-bridging – option 17)

Of these the Fence Short is the primary alarm and the one which enables the sector to be detected. Some of these methods can be disabled, see the programming options.

The siren and keypad beeper will sound and any relays assigned to this fence alarm 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 gate input is opened for longer than the Gate delay time.

After the siren has cycled on and off according to the times and numbers set in options, the siren will stop sounding. The on and off timing is able to be set in the options. The Strobe will remain on. After a further delay (Auto Rearm Time) the siren will again respond to the next alarm condition with a new set of on / off cycles. If the alarm condition is removed, the siren will stop after the end of the current "on" time (Siren On Time). If the siren is silenced (by entering PIN#) then the siren will enter the next "off" cycle (Siren Off Time). If the alarm condition is still present (voltage is low) the siren will sound again after the preset "off" time. If the alarm condition is not present the Energiser is instantly rearmed, irrespective of the auto-rearm setting.

To Silence the Alarm

If there is no Keypad attached simply disarm the ZM20 using the Key switch.

Using a Keypad, enter 1470# to silence the ZM20 siren.

To Disarm

If there is no Keypad attached simply disarm the ZM20 using the Key switch.

Using a Keypad, disarm the system by entering your User PIN and press #.

The Fence or Gate light on the ZM20 will remain on to show the Alarm memory. This can be cleared by entering the Clear Alarm memory command *1#. The Alarm memory will also be cleared when the ZM20 next Arms.

To Clear Alarm Memory

After an alarm occurs pressing *1#, will clear the alarm memory. If the problem still exists the unit will alarm again.

Changing your User PIN

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

Enter your new 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.

For example, the following Keypad sequence will change the User PIN to 8015 from the default PIN:

1 2 3 4 * 0 # 8 0 1 5 # * #

Standby Battery

Should there be a loss of mains power, the standby battery will allow the ZM20 to continue to monitor the fence. This will be indicated on the keypad by the power LED turning off and Trouble – AC Fail will be displayed. The status LED on the ZM20 front panel will also flash twice.

If the loss of power is prolonged, the battery may become discharged and become ineffective. The Power light on the keypad will start to flash indicating that the battery charge is low. The status LED on the ZM20 front panel will flash three times and the Keypad will show *TROUBLE: LOW BAT*

If the standby battery requires replacement, the Status LED on the Energiser will flash 3 times even after the mains power has been restored.

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, a general alarm or a door chime. On flat battery the keypad will always beep 4 times before the energiser automatically enters low power mode to preserve the battery. On AC Fail it will not beep.

Note: The Internal beeper also beeps at Power up.

Summary of LCD Keypad Functions

Default INSTALLER PIN 012345
 Default USER PIN 1234

ZM20 Function	Key 1	Key 2	Key 3	Key 4	Key 5	Key 6	Key 7	Key 8	Key 9	Key 10	Key 11	Key 12
Arm/Disarm	USER PIN				#							
Silence the Siren	1	4	7	0	#							
Start Programming the ZM20	INSTALLER PIN						*	0	#			
Start Programming the Keypad	INSTALLER PIN						*	0	1	#		
Exit Programming (any mode)	*	#										
Re-balance the ZM20 current sensors	INSTALLER PIN						*	1	0	#		
Save a sector split 1 position (percentage)	INSTALLER PIN						*	1	0	1	#	
Save a sector split xx position	INSTALLER PIN						*	1	0	Sector Number		#
Reset and return to factory defaults	INSTALLER PIN						*	6	8	#		
Change a User PIN, 4 Digits	USER PIN				*	0	#	NEW USER PIN				#
Change the Installer PIN, 6 Digits NOTE1	0	0	NEW INSTALLER PIN					#				
Arm All Zones (Multi-zone groups)	USER PIN				*	1	0	#				
Arm Specific Zone (up to Zone 15)	USER PIN				*	1	Zone Number	#				
Disarm All Zones	USER PIN				*	2	0	#				
Disarm Specific Zone (up to Zone 15)	USER PIN				*	2	Zone Number	#				
Switch All Zones to low power mode	USER PIN				*	4	1	#				
Switch Specific Zone to low power mode	USER PIN				*	4	1	Zone Number	#			
Switch All Zones to high power mode	USER PIN				*	4	2	#				
Switch Specific Zone to high power mode	USER PIN				*	4	3	Zone Number	#			
Arm Gate circuits only	USER PIN				*	4	#					
Bypass Siren (All Zones)	USER PIN				*	5	2	#				
Bypass Specific Zone Siren	USER PIN				*	5	2	Zone Number	#			
Re-enable Siren (All Zones)	USER PIN				*	5	1	#				
Re-enable Specific Zone Siren	USER PIN				*	5	1	Zone Number	#			
Bypass Gate Alarm (All Zones)	USER PIN				*	5	4	#				
Bypass Specific Gate Alarm	USER PIN				*	5	4	Zone Number	#			
Re-enable Gate Alarm (All Zones)	USER PIN				*	5	3	#				
Re-enable Specific Gate Alarm	USER PIN				*	5	3	Zone Number	#			
Reset and Display firmware version number	USER PIN				*	6	8	#				

1. To change the Installer PIN, the ZM20 needs to be in Energiser Programming Mode first. ("Start Programming the Z-Series energiser" function)

ZM20 Function	Key 1	Key 2	Key 3	Key 4
Clear Alarm memory	*	1	#	
Display the Group ID of the ZM20	*	2	6	#
Siren test	*	6	3	#
Battery test	*	6	4	#
Show Balance	*	6	5	#
Show Saved Zone Splits (while disarmed), # steps through.	*	6	6	#
Automatically set up even splits. Only works if all splits have just been erased.	*	6	7	#
Re-analyse the group	*	6	8	#
Power Boost	*	9	9	#
Panic – Trigger the Siren and Disarm the Energiser	Press the panic key for 3 seconds continuously			
Keypad Specific Function	Key 1	Key 2	Key 3	Key 4
Change the Keypad Messages to English	*	3	1	#
Change the Keypad Messages to Spanish	*	3	2	#
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	#
Backlight mode On/On with keys/Off	*	8	#	
Display Keypad Model	*	9	#	

SPECIFICATIONS

The specifications table below outlines the power consumption of the ZM20 and the acceptable voltage and current ranges for different inputs and outputs.

Internal battery charger float voltage	14.3Vdc
Internal battery charger charging current	600mA
Power consumption of ZM20 (Note 1)	100mA at 12.5Vdc
Maximum AC input voltage when internal battery charger is supplying 580mA	19Vac
Maximum DC energiser current from "ENERGISER" powered output if using 16Vac supply and internal battery	1.5 Amps
Maximum DC energiser current from "ENERGISER" powered output if using external power supply and battery	3 Amps
Maximum voltage on "In1", "SW2" and "Gate" inputs (Note 2)	5Vdc
Maximum power provided to "Siren" and "Strobe" outputs (Note 3)	35Watts
Maximum Fence Voltage	9.9kV
Maximum Fence Current	80 Amps
Maximum live wire loop impedance	1000 Ohm
Maximum fence load (leakage)	10 kilo Ohm
Sector accuracy (Note 4)	100m or 0.1% of total wire length
Maximum amount of live wire (Note 5)	30km
Maximum loop distance (Note 6)	10km

Note 1: This is the power consumption when none of the powered outputs are active and the keypad is not connected. The rated power consumption may be lower depending on relay configuration and alarm states.

Note 2: The control inputs, In1, SW2 and Gate supply their own power (5 volts, limited to 220uA). If a powered control system is connected to these inputs, the control voltages must not exceed 5 volts.

Note 3: The rated power is the combined output power of both the "Siren" and "Strobe" outputs. The voltage which can be expected on this output is the battery voltage. The combined maximum output current of both these outputs is 2.5 Amps. Note that the maximum output power will drop as battery voltage drops.

Note 4: This may not be achieved on all fences.

Note 5: The amount of live wire is the total number of live wires (irrespective of series or parallel wiring) times the fence length.

Note 6: The loop distance is the total length of the series connected live wire from feed 1 to feed 2.

INSTALLATION

It is recommended that all installations are performed by qualified technicians.

Installation Steps

1. Read the entire ZM20 and Energiser manuals first!
2. Design and build the fence. (Beyond the scope of this manual.) Ask your distributor for help if required.
3. Decide where the energiser, ZM20 and Keypad are to be mounted. If on an external wall it should be housed within an equipment box and not in direct sunlight.
4. Remove the lid of the ZM20 using a 5mm Hex key.
5. Remove the ZM20 PCB chassis from the housing by removing the two screws at the top corners.
6. Mount the housing by using 4 screws through the rear of the box. The box must be mounted to a wall in such a way that all of the 4 holes in the rear of the case are against the mounting surface.
7. Replace the PCB chassis.
8. If using a keypad, remove the rear housing of the keypad and fix it to the wall.
9. Wire the low voltage cables to the PCB terminals.
10. Wire the high voltage cable to the PCB terminals.
11. Set the Jumpers as required
12. Seal the cable entry area with neutral cure silicon sealant RTV.
13. Fit the battery leads to the battery. The Error LED should be blinking twice to show mains fail.
14. The Energiser is designed not to start when first powered up irrespective of the state of the Control Inputs.
15. Replace the front cover (lid).
16. Turn AC power on.
17. Arm the ZM20 and Switch on the Energiser. The LCD display will now show the fence voltage.
18. Find and remove any faults on the fence
19. Balance the ZM20
20. Program the sector split positions.
21. Test that a short in any sector puts the ZM20 into alarm and shows the correct Sector

Notes:

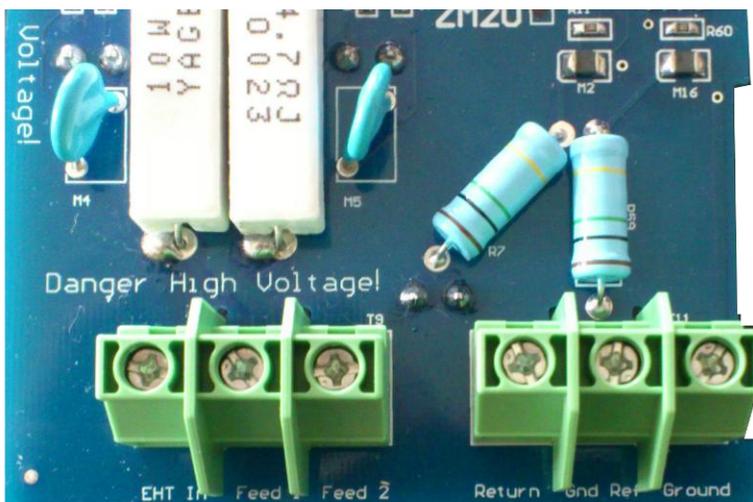
1. If using a JVA MB series energiser with the ZM20, turn the energiser on using the front panel on/off tact switch immediately after arming the ZM20. As the ZM20 controls 12V DC power to the MB energiser it cannot be switched on before the ZM20. Since JVA MB series energisers remember there last state on power fail, they will power on again when next the ZM20 applies 12V DC power. You will not need to use the MB on/off switch again.

Jumper Configuration

The ZM20 is equipped with three jumpers located in the top left corner of the PCB, which perform the following functions:

Jumper	Function	Purpose
J3	Inhibit Mains fail error. OR Tamper disable (Z14R and Z18 Mk2)	J3 is fitted to inhibit Mains fail errors if the intention is to operate the energiser on DC only (as in solar power systems). Disables the Infrared Tamper feature on the Z14R and Z18 Mk2.
J4	Factory default jumper Off to return programmable options to factory defaults on power up.	If the energiser needs to be defaulted to factory settings, remove all power (AC and battery) and remove the J4 jumper. Reapply the mains and the battery power. Reapply the J4 jumper and the Energiser will be reset to default settings.
J5	Inhibit internal Beeper	Fitted to inhibit the internal beeper, irrespective of any option setting.
J6	Energiser Power Selection	If the ZM20 has a 16Vac supply plus internal battery fitted and the energiser is a JVA MB8, set J6 to the 24V setting. If using an external battery set J6 to the 12V setting.

High Voltage Terminals



Description of high voltage terminals (Left to Right)

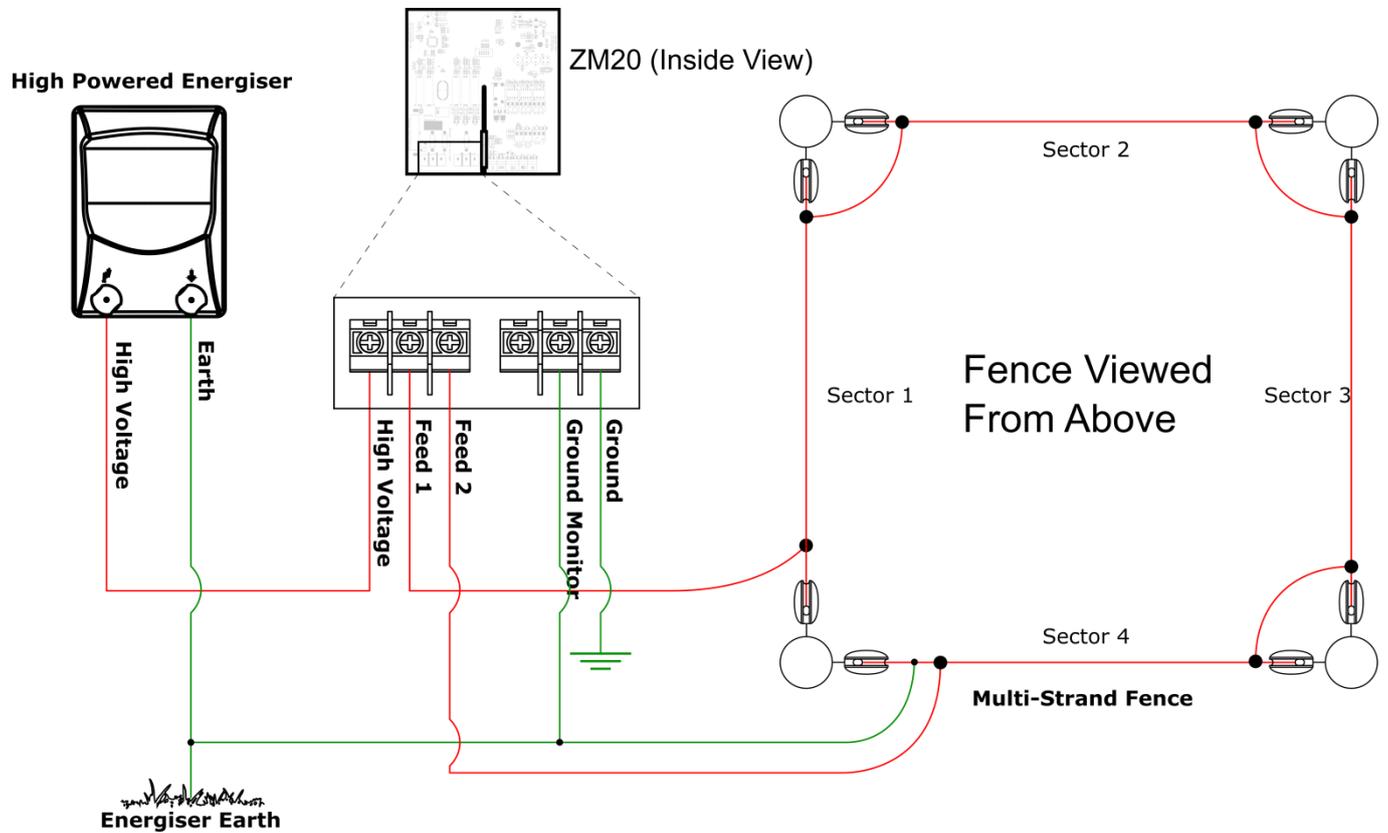
EHT In	Connect the high voltage output of the energiser to this terminal only.
Feed 1	Connect the one end (feed) of the fence loop to this terminal.
Feed 2	Connect the other end (return) of the fence to this terminal. The live wires form a complete loop from Feed1 to Feed 2. The fence voltage is measured from this terminal.
Return	This terminal is connected internally to Feed2. It is not normally used.
Ground Ref	Reference ground connection. Please refer to diagrams "Earth Loop Monitoring", "Earth Steak Monitoring" and "No Earth Monitoring" for information on how to configure this input.
Ground	Main fence earth. Please refer to diagrams "Earth Loop Monitoring", "Earth Steak Monitoring" and "No Earth Monitoring" for information on how to configure this input.

Fence Wiring Diagrams

There are a number of ways the fence wires can be connected to a ZM20. The following diagrams will outline different ways the ground circuit can be configured and what the benefits of each are.

Earth Stake Monitoring

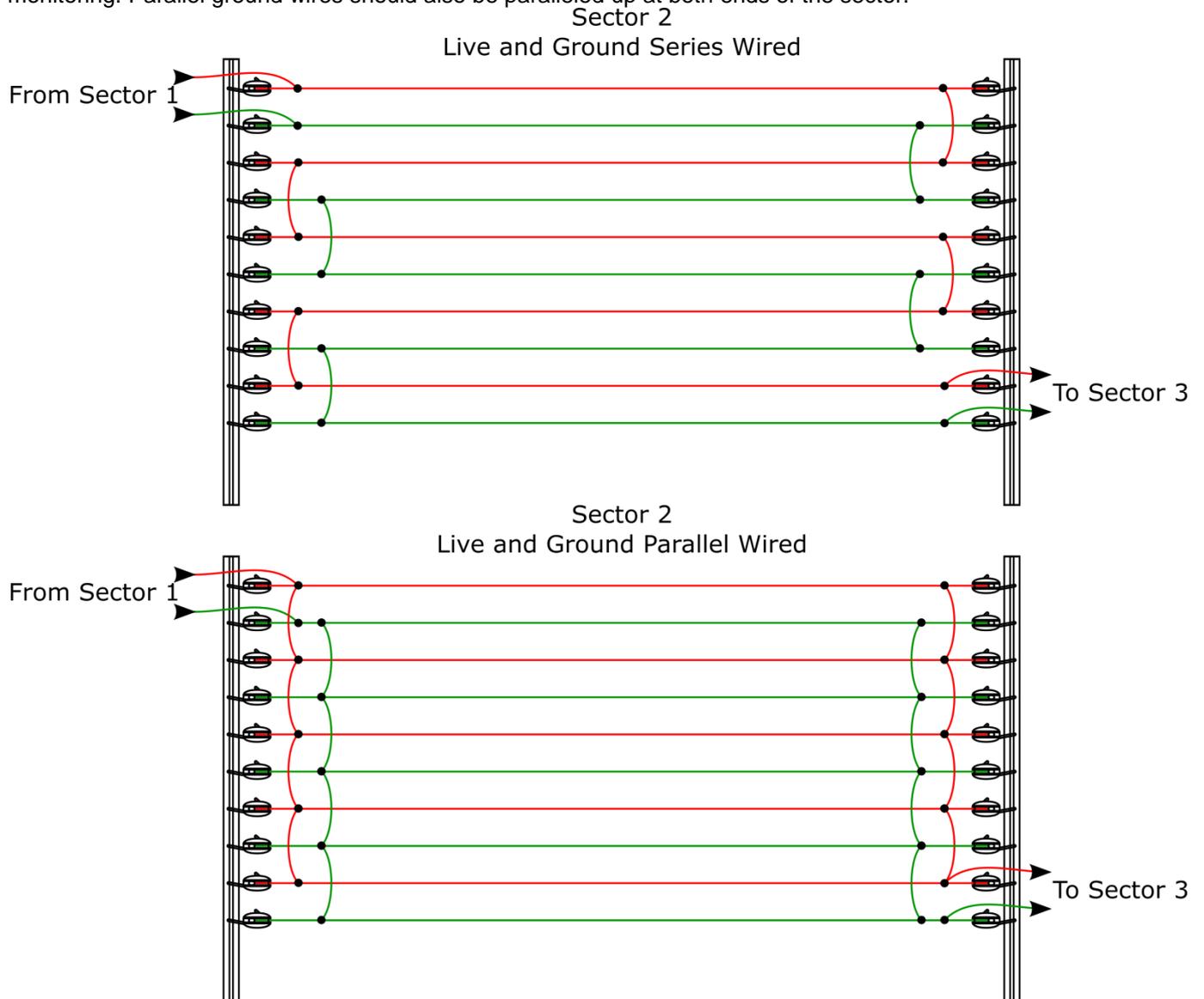
This setup will check how well the energiser is earthed. Connect the "Ground Monitor" input of the ZM20 to the Energiser Earth and connect the "Ground" input to the mains earth, or the cabinet earth.

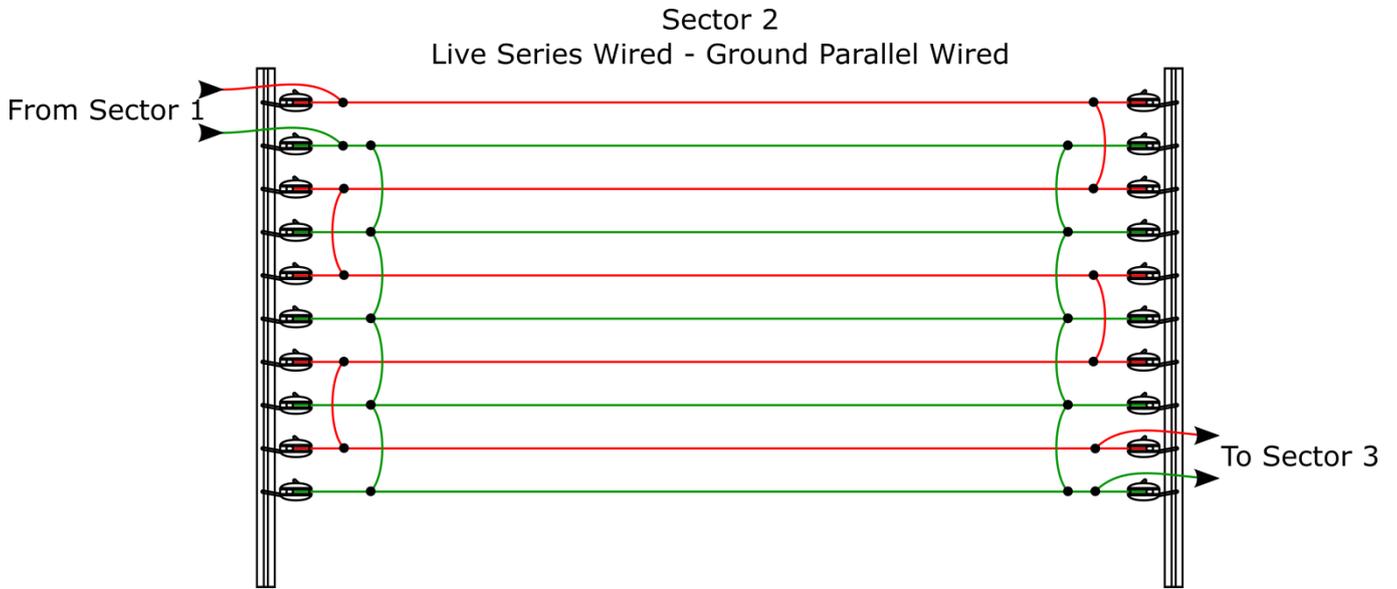


Fence sector wiring

Although series live wiring is recommended, on very long fences parallel wiring may be used. Parallel wiring can result in a fault not being reported if a live wire is cut. If parallel wiring is used, then the live wires should be paralleled up at both ends of the sector.

Ground wires may also be series or parallel. Series ground wiring is only useful if you are using ground loop monitoring. Parallel ground wires should also be paralleled up at both ends of the sector.

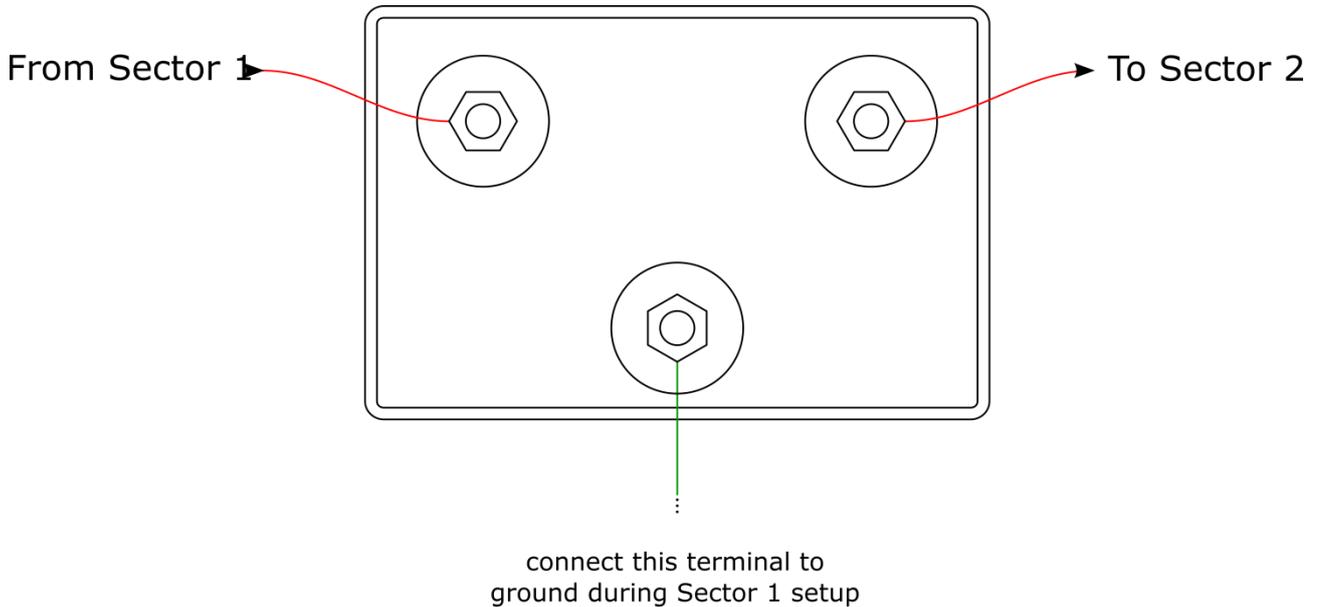




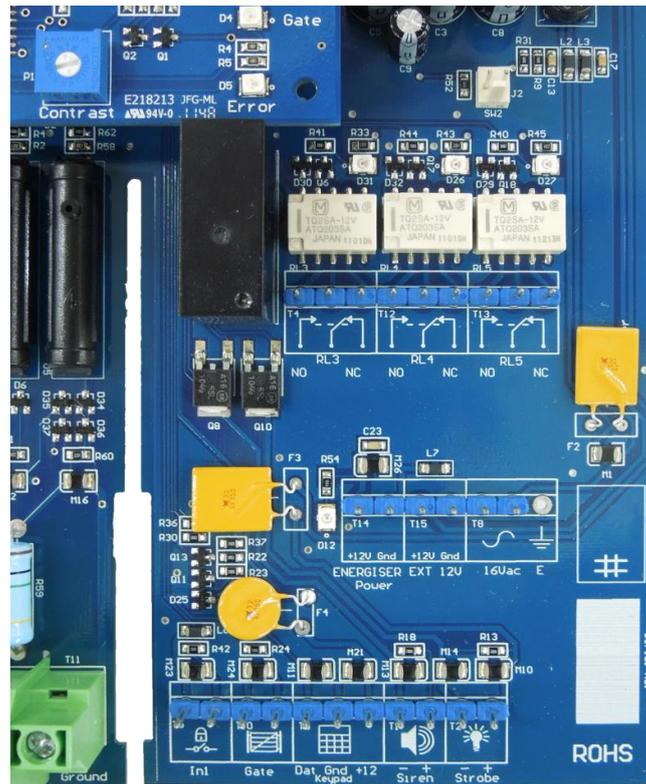
Using a Sector Divider (Splitter)

In order to maintain the highest level of sector reporting accuracy, a Sector Dividers (PTE0063) may be wired between sectors on the fence. This is required when one or more of the sectors is very short and is also recommended between sectors which differ in construction, for example between wall top and free standing sectors.

Note: When programming the sector splits into the ZM20, place the short to ground on the mid (normally unused) terminal of the PTE0063. This means that the sector split is recorded at the theoretical midpoint inside the divider and any real fence short will always be outside.



Low voltage Terminals



Label	Type	Description
SW2	2 Way	Connects to the same microcontroller input as IN1 and functions exactly the same way as IN1. Typically this input is used if a Key switch is fitted to the case.
IN1	2 Way	Energiser control input (dry contact). Defaults to normally open. Can be used for a remote switch or a radio receiver. The receiver may be powered from the keypad +12V terminal.
Gate	2 Way	Energiser control input, defaults to normally open low power but may also be assigned to gate input. When the unit is armed and the gate is opened, it will trigger the gate alarm.
Keypad	3 Way	Supplies power and data line for an external keypad. The +12V source on these terminals is protected with 1A self resetting fuse.
Siren	2 Way	Switched 12 volt output. Low side switched. 35W max (including strobe). A buffer relay should be used when connecting these outputs to an alarm panel.
Strobe	2 Way	Switched 12 volt output. Low side switched. 35W max (including siren). A buffer relay should be used when connecting these outputs to an alarm panel.
Energiser Power	2 Way	Controlled 12V output to a DC energiser. Enabled when the ZM20 is armed. Power is drawn from the ZM20 battery and 16Vac power supply, or from the EXT 12V input.
EXT 12V	2 Way	Feed 12V power into this input as an alternative to the 16Vac. Used for DC energisers which exceed the supply rating of the on board rectifier.
AC IN	3 Way	16Vac power input. Fused via F3 3A self resetting fuse. The Earth terminal may be required to be connected to mains earth in some countries, consult your local wiring guidelines.
Relay 3	3 Way	May be set to any of 16 alarm conditions.
Relay 4	3 Way	May be set to any of 16 alarm conditions.
Relay 5	3 Way	May be set to any of 16 alarm conditions.
Batt	Leads	12V dc or battery connection via F1 (3 Amp self resetting fuse). Connect Red lead to battery positive (+) terminal. (not pictured above)

Low Voltage Wiring Diagrams

Wiring for recommended 12V DC energisers

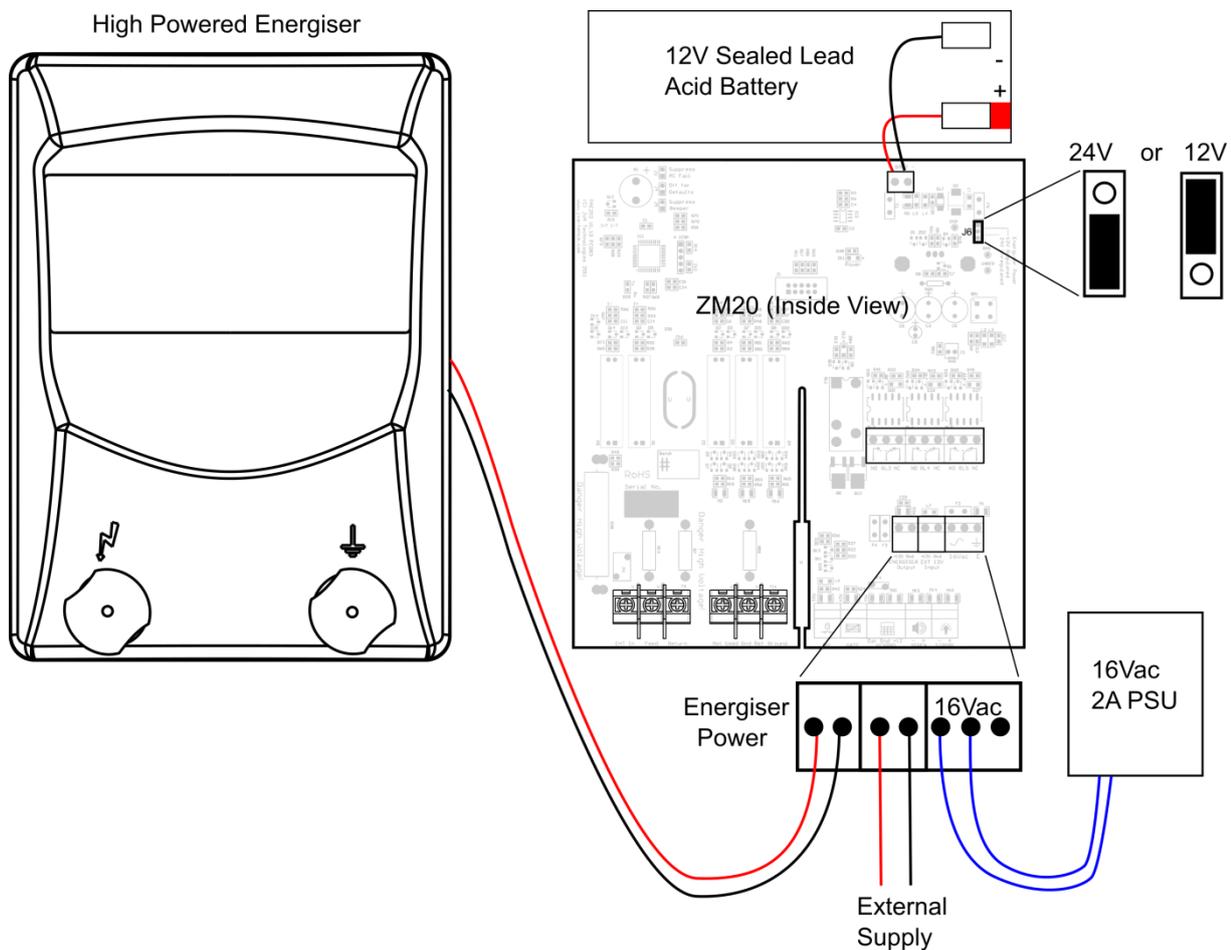
A 16Vac 2Amp power supply is used to run the in-built rectifier and battery charger for the internal 7ah 12V rechargeable battery.

The ZM20 and 12V DC energiser are run from the battery if AC power fails. This option is suitable for JVA MB4.5, MB8 or (or equivalent) energisers.

The DC voltage supplied to the energiser may be unregulated or regulated. For JVA energisers select “24V unregulated” using J6, as this will improve the battery charging current capacity, and reduce heat in the ZM20.

AC power will be monitored and an AC fail alarm can be provided.

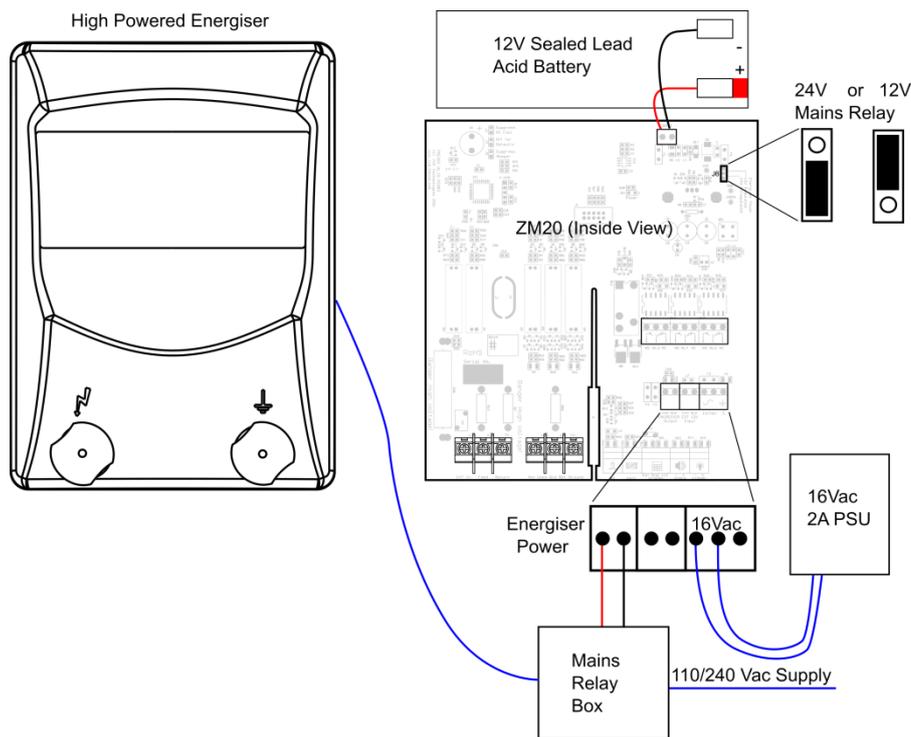
For higher powered DC energisers refer to External Battery and Charger wiring for 12V DC energisers



240Vac Energiser power wiring

The ZM20 can be coupled to a 240Vac energiser.

The ZM20 is used to control an external relay box designed to switch 110Vac or 240Vac to the energiser.

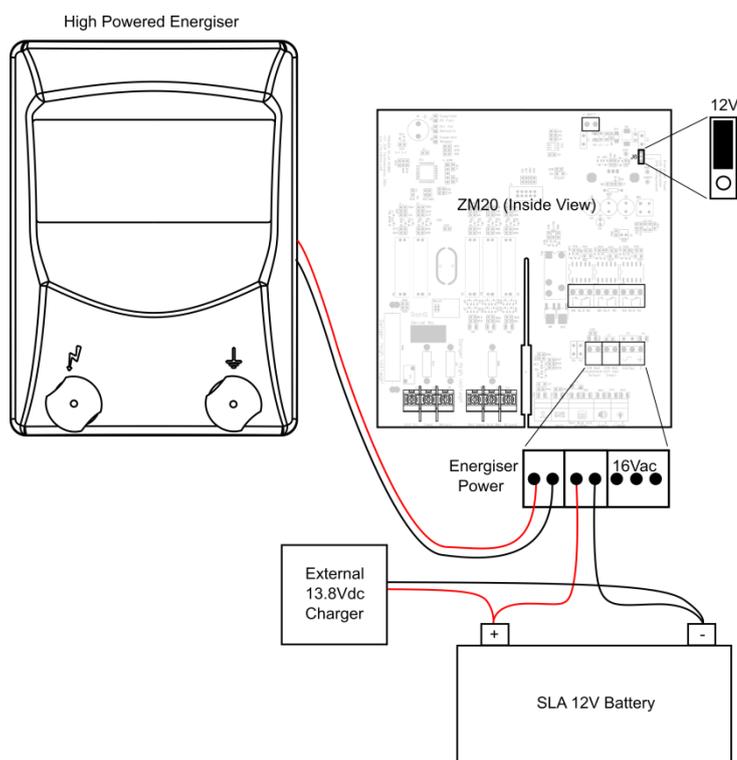


WARNING: DO NOT use relay 3, 4 or 5 on the ZM20 PCB to switch mains voltage.

Mains power must only be wired by licensed electricians.

External Battery and Charger wiring for 12V DC energisers

An external 12V DC source may be used to power both the ZM20 and the coupled DC energiser via the external 12V power input. The Energiser 12V supply is still controlled by the ZM20. This is the recommended circuit if using a JVA MB12 as the energiser.



Ac Fail should be inhibited by fitting J3. There is no fuse protection on the ZM20 for this wiring. A fuse or circuit breaker should be used in the battery circuit.

Combining the ZM20 with a Z18 Series energiser

A ZM20 can be combined with JVA Z series energisers to power the fence. This gives the added advantage that the fence can be turned to low power during the day and still monitored. It also means that a GSM device or PC running Perimeter Patrol can control and monitor the energiser as well as the ZM20.

Note: The ZM20 cannot determine the fault sector or distance while the energiser is in low power mode and should be disarmed when the Z18 is operating in Low Power mode.

If the ZM20 is to be used with a Z18 the ZM20 should not be configured to control the 12V DC power to the energiser. The Z18 should have its own supply and battery, or alternately both the Z18 and the ZM20 can both be run from a suitable external 12V source.

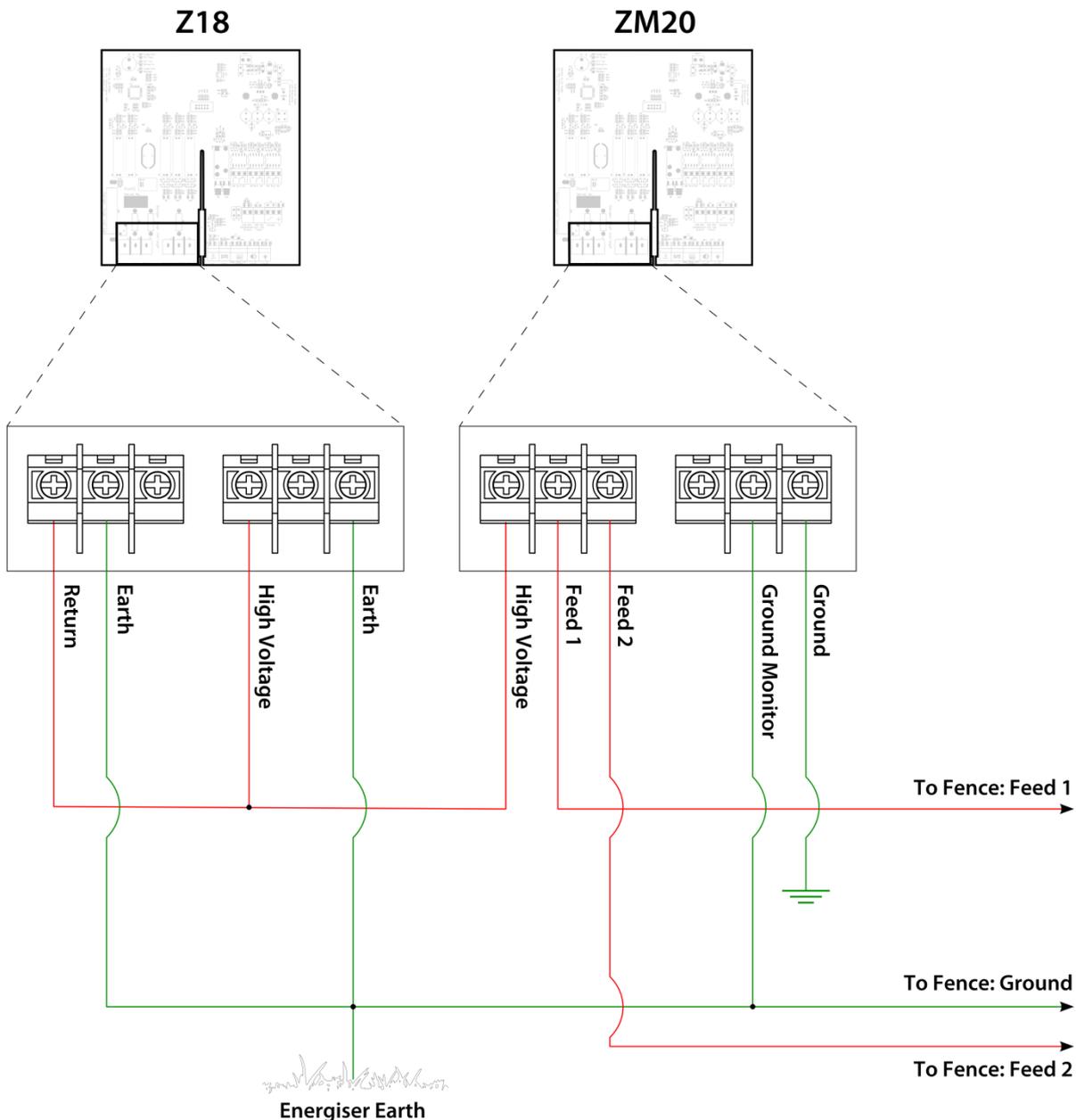
The Z18 energiser and ZM20 should be configured in group mode and controlled using a Z series LCD Keypad, or from a contact which is parallel wired to the IN1 control input on both units. The Z energiser should always be the master, not the ZM20.

If the ZM20 is armed but the energiser is not, the ZM20 will report an "Energiser Fail" alarm.

Up to 7 pairs of Z18 energiser and ZM20 can be connected into a group via the keypad bus and this can be extended to over 100 by using PAE212 TCP/IP adaptors.

The Z18 should be configured for maximum power unless doing so causes arcing on the fence.

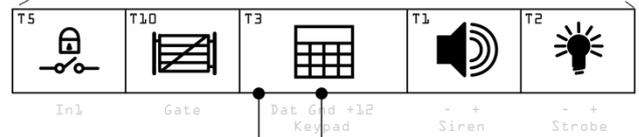
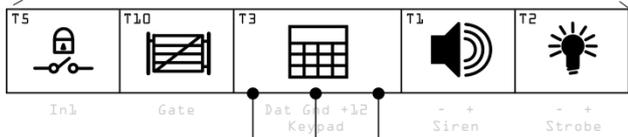
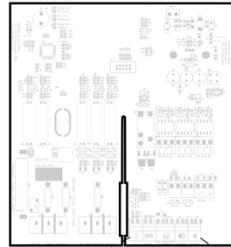
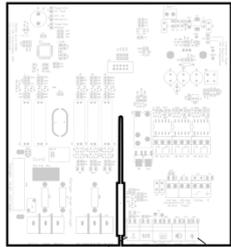
High Voltage Wiring



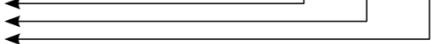
Low Voltage Wiring

Z18

ZM20



To Keypad or
Auxiliary Equipment



Group Mode configurations

MB8 with a Keypad



- Set the Group ID of the ZM20 to Master (2601#), or leave it in Stand-Alone Mode (2600#)

A ZM20 by itself does not require the Group ID to be configured as it is factory set to Stand-Alone mode

Z18 with a Keypad



- Set the Group ID of the Z18 to Master (2601#)
- Set the Group ID of the ZM20 to Slave 1 (2602#)

The Group ID of the ZM20 must be 1 value higher than the Group ID of the Z-Series Energiser driving it

Two Z18s with a Keypad



- Set the Group ID of the first Z18 to Master (2601#)
- Set the Group ID of the first ZM20 to Slave 1 (2602#)
- Set the Group ID of the second Z18 to Slave 3 (2604#)
- Set the Group ID of the second ZM20 to Slave 4 (2605#)

A ZM20 requires the use of 2 Group ID values. This is the reason there is a 'Group ID gap' between the first ZM20 and the second Z18

Two Z18s connected to Perimeter Patrol through a PAE223 (USB Interface)



- Set the Group ID of the first Z18 to Master (2601#)
- Set the Group ID of the first ZM20 to Slave 1 (2602#)
- Set the Group ID of the second Z18 to Slave 3 (2604#)
- Set the Group ID of the second ZM20 to Slave 4 (2605#)

A ZM20 requires the use of 2 Group ID values. This is the reason there is a 'Group ID gap' between the first ZM20 and the second Z18

MB8/MB12 connected to Perimeter Patrol through a PAE212 (TCP Interface)



- Set the Group ID of the first ZM20 to Slave 1 (2602#)
- Set the Group ID of the second ZM20 to Slave 3 (2604#)

The PAE212 is the Master device (2601#) in the Group. Therefore all other connected devices must be set Slaves.

The MB8/MB12 is not connected to the Keypad Bus; therefore it does not require a Group ID value. This also means that the Energiser pulses are not synchronised.

Note: MB8s will Auto-synchronise when they are cross coupled due to a fence fault. However a 2.5 metre isolation gap is still required between these fences when complying with International Electric Fence Standards

PROGRAMMING OPTIONS

Like the Z series of security energisers, the ZM20 has non-volatile memory in which programming options (or setup parameters) can be stored. These are factory pre-set (defaults), but can be field programmed using a keypad.

Enter 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 on the ZM20 will now show the first programming option and its current setting.

Pressing the # key will cycle through all the options on the LCD. Not all numbers are used. See the Options table below. Summary of LCD Keypad Functions

Default INSTALLER PIN 012345
 Default USER PIN 1234

ZM20 Function	Key 1	Key 2	Key 3	Key 4	Key 5	Key 6	Key 7	Key 8
Arm/Disarm	USER PIN				#			
Silence the Siren	1	4	7	0	#			
Start Programming the ZM20	INSTALLER PIN						*	0
Start Programming the Keypad	INSTALLER PIN						*	0
Exit Programming (any mode)	*	#						
Re-balance the ZM20 current sensors	INSTALLER PIN						*	1
Save a sector split 1 position (percentage)	INSTALLER PIN						*	1
Save a sector split xx position	INSTALLER PIN						*	1
Reset and return to factory defaults	INSTALLER PIN						*	6
Change a User PIN, 4 Digits	USER PIN				*	0	#	
Change the Installer PIN, 6 Digits NOTE1	0	0	NEW INSTALLER PIN					
Arm All Zones (Multi-zone groups)	USER PIN				*	1	0	#
Arm Specific Zone (up to Zone 15)	USER PIN				*	1	Zone Number	
Disarm All Zones	USER PIN				*	2	0	#
Disarm Specific Zone (up to Zone 15)	USER PIN				*	2	Zone Number	
Switch All Zones to low power mode	USER PIN				*	4	1	#
Switch Specific Zone to low power mode	USER PIN				*	4	1	Zone l
Switch All Zones to high power mode	USER PIN				*	4	2	#
Switch Specific Zone to high power mode	USER PIN				*	4	3	Zone l
Arm Gate circuits only	USER PIN				*	4	#	
Bypass Siren (All Zones)	USER PIN				*	5	2	#
Bypass Specific Zone Siren	USER PIN				*	5	2	Zone l
Re-enable Siren (All Zones)	USER PIN				*	5	1	#
Re-enable Specific Zone Siren	USER PIN				*	5	1	Zone l
Bypass Gate Alarm (All Zones)	USER PIN				*	5	4	#
Bypass Specific Gate Alarm	USER PIN				*	5	4	Zone l
Re-enable Gate Alarm (All Zones)	USER PIN				*	5	3	#
Re-enable Specific Gate Alarm	USER PIN				*	5	3	Zone l
Reset and Display firmware version number	USER PIN				*	6	8	#

- To change the Installer PIN, the ZM20 needs to be in Energiser Programming Mode first. (“Start Programming the Z-Series energiser” function)

ZM20 Function	Key 1	Key 2	Key 3	Key 4
Clear Alarm memory	*	1	#	
Display the Group ID of the ZM20	*	2	6	#
Siren test	*	6	3	#
Battery test	*	6	4	#
Show Balance	*	6	5	#
Show Saved Zone Splits (while disarmed), # steps through.	*	6	6	#
Automatically set up even splits. Only works if all splits have just been erased.	*	6	7	#
Re-analyse the group	*	6	8	#
Power Boost	*	9	9	#
Panic – Trigger the Siren and Disarm the Energiser	Press the panic key for 3 seconds continuously			
Keypad Specific Function	Key 1	Key 2	Key 3	Key 4
Change the Keypad Messages to English	*	3	1	#
Change the Keypad Messages to Spanish	*	3	2	#
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	#
Backlight mode On/On with keys/Off	*	8	#	
Display Keypad Model	*	9	#	

in the Operation section of this manual.

The default installer PIN is 012345

To exit programming mode

To exit programming mode press *#. If left unattended the ZM20 will time out and auto exit after approximately 5 minutes.

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 ZM20 memory to default. To do this, remove power (AC off and disconnect the battery), open the ZM20, remove jumper J4 and reconnect the battery for about 10 seconds. Do not forget to re-fit J4.

This will return all options to the factory set defaults.

Changing an Option

The options have possible values in the range of 0 to 99, some are limited to lower maximum values. To change an option value, first check the option number (see table below) and then the table of values for that option. On the Keypad, press the option number followed by the required value.

For example, to change option 1 to the maximum press 0199#, the keypad will beep twice to indicate that the command was successful. The Energiser LCD will immediately show the updated value.

As the keypad bus is common to a group of Z-Series Energisers and ZM20s, one keypad could be used to program all connected units at the same time. A Group containing Z-Series Energisers and ZM20s MUST NOT get programmed this way as the ZM20 contains different Option values to the Z-Series Energisers. Each ZM20/Energiser will need to be isolated from the Group Wiring and programmed individually.

Programmable Options Table

Option	Function	Default	Description
01	Fence Voltage alarm level	40 (4.0kV)	Sets the voltage below which the fence alarm will occur. If either feed voltage falls below this level for more than the Missed pulse count a fence alarm will occur.
02	Feed Current alarm level	20A	Sets the threshold to alarm on current from either feed terminal to the fence. If the either feed current (feed 1 or feed 2) rises above this level for more than the Missed pulse count a fence alarm will occur.
03	Ground Voltage alarm level	10 (1.0kV)	Sets the voltage above which the fence alarm will occur. If the ground voltage rises above this level for more than the Missed pulse count a ground alarm will occur. When this alarm is triggered the ZM20 will display the sector number of the fault.
04	Fence Cut Alarm	0	Sets the percentage balance change either side of 50% for which the Fence Cut alarm will occur.
05	Not used	0	
06	Missed Pulse Count	3	Sets the number of pulses which may be missed before the alarm is activated
07	Battery Alarm Voltage	2 (10V)	Sets the battery voltage threshold below which the general alarm will activate
08	Siren On Time	4 (3 Mins)	Sets the time that the siren (and keypad beeper) will stay on after an alarm
09	Siren Off Time	4 (10 Min)	The amount of time the siren will be off for after the <i>on</i> time has expired
10	Siren Cycles	3	The number of times the siren will sound for the time set in <i>on time</i> above. After this many cycles the siren will automatically mute
11	Input type	0 (N/O)	Allows the control inputs to be changed from normally open to normally closed.
12	Input 2 Function	0	Gate switch
13	Gate Delay	2 (1 Min)	Gate switch open time till alarm
14	Chime Mode	2 (siren)	Allows the keypad and internal beeper function to be altered
15	Fence Mode	0	To be advised
16	Binary Options	0	Miscellaneous options
17	Anti-bridging	0 (off)	Sets the % threshold for alarm on a sudden rise or fall of fence current.
18	Sectors	0 (off)	Sectors 0-20 (0 means none)
19	Not used	0	
20	Auto Rearm Time	0	Sets the time which must elapse after an alarm has timed out (completed the siren cycles) before the unit will automatically re-arm ready for the next alarm event.
21	Relay 1	8	Used to assign an alarm function to relay 1 (siren output)
22	Relay 2	9	Used to assign an alarm function to relay 2 (strobe output)
23	Relay 3	0	Used to assign an alarm function to relay 3
24	Relay 4	2	Used to assign an alarm function to relay 4
25	Relay 5	7	Used to assign an alarm function to relay 5
26	Group ID	0	If used as part of a group, this sets the device ID

Programming Options in Detail

Fence Voltage Alarm Level (01xx#)

Sets the voltage below which the Fence Low Voltage alarm will occur. If the fence voltage measured at Feed 2 (and Return) EHT terminals, falls below this level for more than the Missed pulse count a fence alarm (sector 1) will occur. The value is set directly, not via a table.

For example to set a threshold of 5.0kV enter: 0 1 5 0 #

Do not enter the decimal! The default level is 4.0kv (40), maximum is 99.

As the ZM20 is primarily a current monitor, it is not strictly necessary to use the low voltage alarm. Setting this option to 0 effectively turns off fence low voltage monitoring. It is useful for determining that the energiser is operating correctly. A Fence Short alarm take precedence over this alarm.

Value (x)	Alarm Level
Minimum	
0	0.0 kV
Default	
40	4.0kV
Maximum	
99	9.9 kV

Warning: Setting this level to higher than the normal running voltage of the fence will result in continuous fence alarms.

Feed Current Alarm Level (02xx#)

Sets the alarm threshold for a Fence Short alarm. If either feed current rises above this level for more than the Missed pulse count a fence alarm (sector 1) will occur.

The value is set directly, not via a table. For example to set a threshold of 15A enter: 0 2 1 5 #

The default level is 20A, the maximum is 75A.

This value must be set below the higher of Feed 1 and 2, shown when a short is placed at the mid point of the fence. The Sector is only shown after a Fence Short alarm occurs.

Value (x)	Alarm Level
Minimum	
0	0 Amps
Default	
20	20 Amps
Maximum	
75	75 Amps

Ground Voltage Alarm Level (03xx#)

Sets the voltage above which the fence ground alarm will occur. If a difference in voltage is measured between the Ground and Ground reference EHT terminals of above this level for more than the Missed pulse count a ground alarm will occur.

The value is set directly, not via a table. For example to set a threshold of 2.0kV enter: 0 3 2 0 #

Do not enter the decimal! The default level is 1.0kv (10)

This can be used to monitor for Ground stake voltage or fence ground circuit voltage depending on the fence wiring.

This setting is irrelevant if the Ground and Ref Ground terminals are shorted together.

Value (x)	Alarm Level
Minimum	
0	0.0 kV
Default	
10	1.0 kV
Maximum	
50	5.0 kV

Fence Cut Alarm Level (04xx#)

Sets the percentage balance change either side of 50% for which the Fence Cut alarm will occur. In normal running, with no faults, the fence currents should be well balanced. Meaning the current Feed 1 and Feed 2 will be close to the same value in Amps. When they are equal the balance value is close to 50%.

The Balance can be checked at any time the fence is on by entering *65# on the keypad.

If the fence is cut the currents will be unbalanced. A setting of 20% means that the Fence Cut alarm will show if the balance moves below 30% or above 70%.

A Fence Short alarm will take precedence over a Cut alarm.

On some fences a fence load device may need to be installed to ensure this alarm worked properly for all fence cuts.

Value (x)	Alarm Level
Minimum	
0	Disabled
Default	
0	Disabled
Maximum	
50	50%

Missed Pulse Count (06xx#)

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. The value is set directly. For example to set a threshold of 2 bad or missing pulses enter: 0 6 0 2 #.

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

Battery Alarm Voltage (07x#)

This option sets the battery voltage threshold below which the general alarm will activate. The default Battery Alarm Voltage is 10.0 Volts. This alarm can be set to activate one of the relays, and is part of the General alarm.

Note: The ZM20 will not turn the energiser off when the battery voltage is low. But if the supply voltage falls too low the relay powering the external energiser will eventually drop out.

Value	Alarm
0	9.0 V
1	9.5 V
2	10.0 V
3	10.5 V
4	11.0 V
5	11.5 V
6	12.0 V
7	12.5 V
8	13.0 V
9	13.5 V

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 indicated in the table. 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

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

Siren Cycles (10x#)

This option sets the maximum number of times the siren will sound for the “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.

The value is set directly. For example to 2 siren cycles enter: 1 0 2 #.

The default is 3, minimum is 1 and the maximum is 9.

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

Input Type (11x#)

The control inputs can be inverted.

Unless an input 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
2	Momentary

Input 2 Function (12x#)

This input cannot be configured to anything other than a ‘Gate’ input at this time.

Gate Delay (13x#)

The gate switch must remain open for longer than the **GATE ENTRY/EXIT DELAY** before the Gate Alarm is triggered. If the switch closes within this time, the Gate timer is reset to the **GATE ENTRY/EXIT DELAY** value.

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	8 Minutes

Chime mode (14x#)

This option allows the ZM20 internal beeper and the 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.

When set to *Door Chime*, the beepers will sound when the gate switch opens, even if the energiser is disarmed. Note “Gate” must be selected in **INPUT 2 FUNCTION** (Option 12).

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

Gate Beeps plus Siren will give 2 beeps on Gate open and 4 on close, plus continuous for an alarm. Beeps are on Keypad only, not internal beeper.

Value	Function
0	None
1	Door Chime
2	Siren
3	Fence Alarm
4	Gate beeps plus Siren

Fence Mode (15x#)

Not currently implemented, for future use.

Binary Options (16x#)

Each option in this table can be turned on by adding the value.
For option+ 1 set 16 to 01, for + 1 and +2 set 16 to 03.

+1: Enable DFD™ (Distant Fault Detection).

Not implemented on the ZM20 yet.

+2 Set if using a ZM20 in a group where the energiser is not a Z series energiser.

This tells the ZM20 that the energiser may not be synchronised.

Value	Function
0	None
+1	Engage DFD
+2	Non Z series energiser

Anti-bridging Alarm Level (17x#)

ANTI-BRIDGING has been designed to detect an attack whereby feed 1 is connected (bridged) to feed 2 with a short cable, and then the entire fence is cut to remove voltage from the live wires. When this is done the total fence current (Feed 1 plus Feed 2) will fall.

Setting this option to a value greater than 0 (default is 0 = off) will enable **ANTI-BRIDGING**.

While Armed, an Anti-Bridging Fence Alarm will trigger if the total Fence Current rises OR falls quickly by more than the threshold. The **ANTI-BRIDGING THRESHOLD** is a percentage value of the Fence Current.

For Example, setting option 17 to 50 (1750#) will set a 50% **ANTI-BRIDGING THRESHOLD**. At this level a Fence Current normally reading 10Amps will trigger a Fence Alarm if the Current quickly rises to over 15A or falls to less than 5A.

Note: A slow change to the Current will trigger a Fence Alarm when the Current is more than the **CURRENT ALARM LEVEL (02x#)**.

Value (x)	Threshold
Minimum	
0	Disabled
Default	
0	Disabled
Maximum	
90	90%

Sectors (18x#)

Setting this option from 2-20 engages Sectoring and tells the system how many sectors the fence is divided into.

When a fault occurs (as defined by the total current exceeding the "current alarm level" set in option 2) the ZM20 will determine which sector the short is in.

Each sector division needs to be programmed into the ZM20. The sector programming procedure is outlined below.

WARNING Setting this option to 0 clears all sector calibration data.

The ZM20 cannot show more than 1 faulted sector at any time.

Value (x)	Sectors
Minimum	
0	Disabled
Default	
0	Disabled
Maximum	
20	20 Sectors

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).

If an event occurs 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.

A setting of 9 will disable auto re-arm.

The default is 0 Seconds (Immediate).

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

Relay Functions

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

Relay 1 is **(21x#)**

Relay 2 is **(22x#)** etc

Defaults for the ZM20

- Relay 1 – Siren (8)
- Relay 2 – Strobe (9)
- Relay 3 – Fence Alarm (0)
- Relay 4 – Armed (2)
- Relay 5 – General (7)

Note:

1. The siren and strobe switched 12V outputs can be used to drive external buffer relays.

Value (x)	Mode
0	Fence Alarm
1	Fence Alarm or Disarmed
2	Armed
3	Ground Alarm
4	Ground Alarm or Disarmed
5	Un-used
6	Fence or Ground Alarm
7	General
8	Siren
9	Strobe
10	AC Fail
11	Low / Bad Battery
12	Un-used
13	Un-used
14	Gate Alarm
15	Siren caused by Gate Alarm

Function	Logic for alarm state (opposite of normal state)
Fence Alarm	The ZM20 is Armed (Energiser on) AND Any Fence alarm occurs, these include The Fence Voltage has fallen below the Fence Voltage Alarm Level (Low Voltage) The Feed Current has increased above the Feed Current Alarm Level (Short) Or Anti-bridging, Energiser fail or Fence Cut alarm. for more Energiser pulses than the Missed Pulse Count setting. Not latched.
Fence Alarm or Disarmed	The ZM20 is Disarmed OR Any Fence alarm occurs, these include The Fence Voltage has fallen below the Fence Voltage Alarm Level (Low Voltage) The Feed Current has increased above the Feed Current Alarm Level (Short) Or Anti-bridging, Energiser fail or Fence Cut alarm. for more Energiser pulses than the Missed Pulse Count setting. Not latched.
Armed	The ZM20 is Armed (Energiser on)
General	AC Fail OR Tamper OR Low Battery OR Gate Alarm OR Internal Error. Latched for internal errors only.
Siren	Fence Alarm OR Gate Alarm OR Tamper. This 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 ZM20 is disarmed and then re-armed. This function is latched.
AC Fail	Alarm on AC Fail
Battery	Alarm on low or bad battery
Ground Alarm	The ZM20 is Armed (Energiser on) AND The Ground Voltage has risen above the Ground Voltage Alarm Level for more Energiser pulses than the Missed Pulse Count setting. Not latched.

Group Mode (26x#)

A group must have only 1 master. The other Energisers/Monitors in the group are slaves. As the keypad bus is common among the group, one keypad could be used to program all Energisers/ZM20 for all Options. As the ZM20 contains different Option values to the Z-Series Energisers, it MUST not be programmed this way.

The correct procedure is:

Connect the keypad to each Energiser/ZM20 in turn, programming each Option as required before linking the Keypad bus into a group.

As of code version 1.58+ the ZM20 can now be a group master in limited circumstances.

Groups can now be made up of:

ZM20's (driven by MB8 or similar energisers) or Z series energisers and ZM20's.

If the group contains Z series energisers an energiser should be the master.

If one or more ZM20's are connected via a TCP/IP board to a PC then the TCP/IP board will be the master.

If any ZM20 in a group is coupled to a non Z series energisers all slave ZM20's must have Option 16 set to 2.

Since MB8's or similar energisers cannot be synchronised over the keypad bus the normal rules regarding using an isolation barrier between two fences powered by non-synchronised energisers apply.

In Perimeter Patrol the ZM20 appears as a 2 Zone energiser showing Feed voltage for Zone 1 and Ground voltage for Zone 2.

If you are controlling ZM20's in a group using a keypad then the ZM20's should be spaced 2 ID's apart like a Z28.

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
10	Slave 9
11	Slave 10
12	Slave 11
13	Slave 12
14	Slave 13
15	Slave 14

Keypad programming

Changing the Keypad Messages and Address

The messages and each of the 15 zone labels can be changed.

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, 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")
- ZONE NAMES
- BAUD RATE (should be left at 2400)
- KEYPAD ADDRESS (should be left at 1)

To Exit Keypad Programming

When you have finished programming, press [*] [#].

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.

Connecting Multiple Keypads to a system

Up to three keypads may be used to remotely monitor and control the Z series 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-authorized 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.

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 adding/removing 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 ([USER PIN]*68#) before the new ID's will be properly reported to the keypad.

SECTOR PROGRAMMING METHOD

In order to determine which Sector the fault is in, the system must be programmed with the end position of each sector (the division between each sector, also known as the sector “split”).

NOTE: Make sure the ZM20 cover is on if there is any chance of sunlight hitting the PCB. Bright light shining on the IR optical couplers will cause errors in the readings.

1) Clear the settings

The sectoring system defaults to off (option 18 = 0).

When first setting up a new fence leave sectoring off until you are sure the fence is working correctly and there are no faults. If the sectoring system was previously on, turn it off now to clear the settings by changing option 18 to 0. Exit programming mode.

2) Check the fence

Check the fence by running over it using a JVA Fault finder (Pakton Power Probe). The current from each feed (feed1 and 2 measured at the fence) should be the same, or very similar. If one is much higher than the other you may have a fault in which case do not proceed until you find and eliminate all faults.

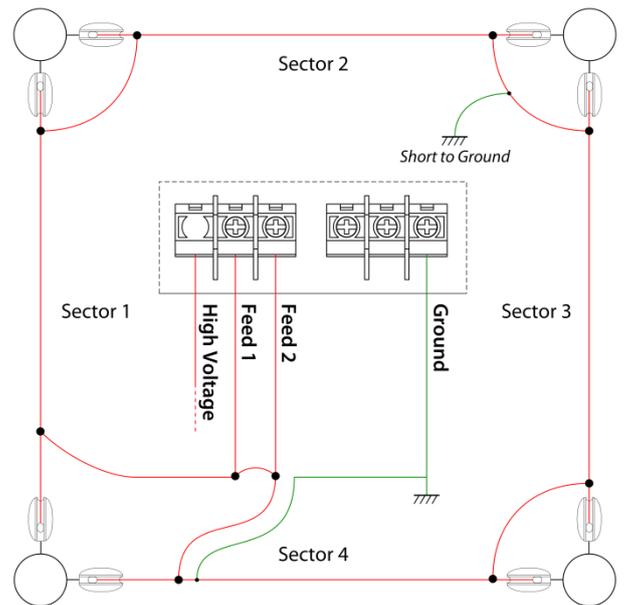
3) Check the ZM20 goes into current alarm

Place a link from Feed1 to Feed2 at the ZM20 terminals, leaving the wiring to the fence in place. Place a short (using an alligator to alligator “jumper” cable) on the fence at approximately the midpoint (end of sector 10 for a 20 sector fence) from live to a ground wire. This represents the hardest fault to detect, as other positions will draw more current.

Turn the fence (ZM20 and energiser) on. Check that the ZM20 goes into alarm. If it does not, reduce the setting of option 2.

Tips:

- To ensure the ZM20 goes into “current” alarm turn voltage alarming off by setting option 1=0 (010#) and turn anti-bridging off, by setting option 17=0 (170#).
- Since the sector programming means placing intentional shorts on the fence, to stop alarms sounding: Remove any connection to a siren and set programming option 14 to 0 to stop the keypad and ZM20 from beeping. Finally set option 6=9 (069#) to provide enough time to read the Fence Current once the system is settled.
- Set Option 2 to a value greater than the maximum Feed Current as displayed on the ZM20 display.



4) Check the current balance

With the link and fence short still in place from step 3) above:

Check that the position reading is at 50% of full fence length.

Note that you can view the “balance” by pressing *65# at any time.

If the reading is not very close to 50%, you will need to re-balance the current sensors by entering the re-balance keypad sequence [Installer PIN]*10#.

Note: The ZM20 will not re-balance if either current is less than 5A or greater than 75A.

If you cannot achieve balance do not proceed. Contact your JVA distributor for help.

Assuming you did achieve balance, disarm the ZM20 (turn the fence off).

Remove the link from Feed1 to Feed2 at the ZM20 terminals.

Remove the short you placed on the fence from step 3).

Alarm - Short
at 50.33%

5) Engage Sectoring

Enter programming mode ([Installer PIN]*0#) and set option 18 to 20 (for 20 sectors, or however many sectors the fence actually has). Exit programming mode.

6) Record sector end points

Place a short (using an alligator to alligator “jumper” cable) at the very end of sector 1 between live and earth preferably using the fence earth wire nearest the exit point of sector 1. Sector 1 is the sector directly powered from the Feed 1 terminal.

If you are using a Sector Divider (PTE0063) place the short from the centre terminal to ground.

When the ZM20 goes into alarm it will display Sector 1 - Short and the position (as a percentage of the whole fence length). Make sure the readings are steady, if it is fluctuating wait until it settles.

Enter the code [Installer PIN]* 101# to store the position of the end of sector 1 to the ZM20 memory.

Record the position percentage in the table provided below.

Remove the short at the end of Sector 1 and move it to the end of Sector 2. When the ZM20 goes into alarm it will display Sector 2 – Short.

Enter the confirmation code [Installer PIN]*102#

Record the position percentage in the table provided below.

Continue to move the short to each sector end and enter the sector confirmation code as [Installer PIN]*1[Sector Number]#. The sector number is always a two digit value; therefore sector 3 is entered as 03.

Note: The last short will be placed at the end of Sector 19 for a 20 sector fence, not at the end of Sector 20 as this is directly connected to Feed2.

Sectors MUST be entered in sequence. The ZM20 display will show the ‘expected’ Sector number when a short is applied.

7) Confirm the Sector Percentages are correct

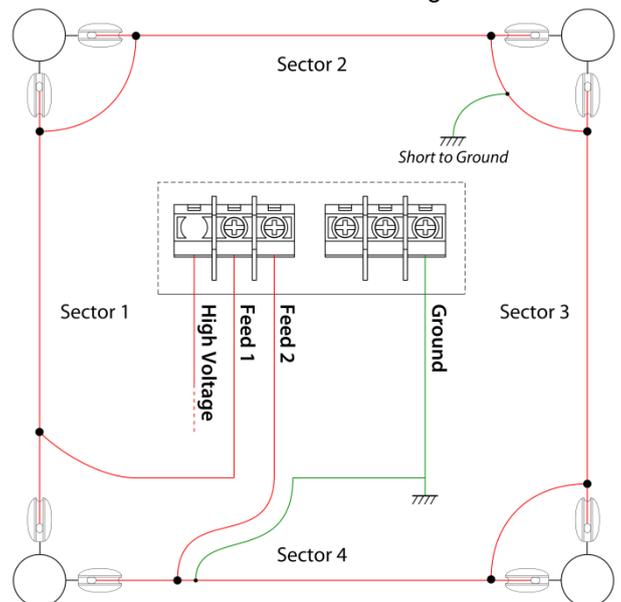
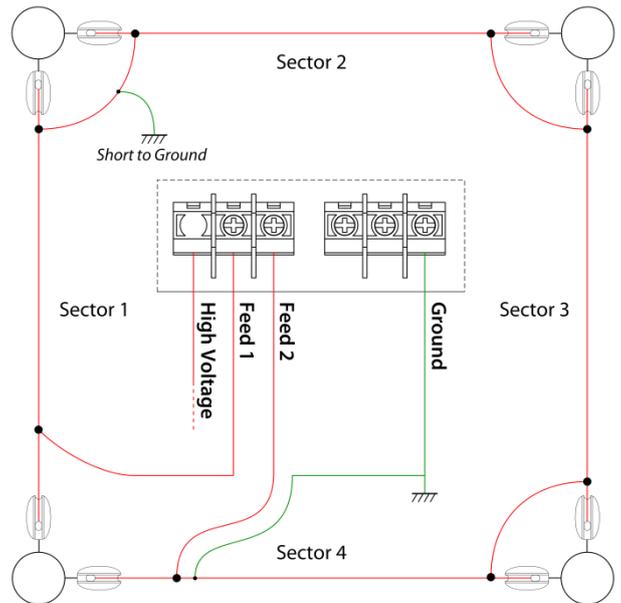
Check the table of sector end positions (percentages) you recorded. If you missed any you may use *66# (while disarmed) to show them again, press the # key (slowly) to step through the sectors.

These numbers must be in increasing order! If for example the reading for end of sector 3 is lower than that for sector 2, something is wrong. If the sectors are short and there is no difference between the reading for one sector and the next you may need to fit a passive sector definer between them. There should be approximately 5.00% difference between each sector.

If a mistake is made, the sector memory may need to be cleared by setting option #18 to 0 and then exiting programming mode. Re-enter programming mode and set option #18 back to the desired number of sectors. Start the process over from step 4).

8) Check the sector positions are working.

After recording all the sector end points, return to sector 1 and place a short somewhere on Sector 1. Check that the ZM20 reports Sector 1. If you are close to the end of sector 1 the ZM20 may report Sector 1 and 2 (alternating).



9) Restore the alarm settings.

Remember to set and check the voltage alarm setting in option 1 (if used) and the Anti-bridging setting in option 17.

If you removed siren wiring in step 3) and or inhibited the onboard beeper (J6) or the Keypad siren also restore them to their correct settings and check that they operate.

NOTE: If after sector programming the fence, it is altered (wires added or removed) or sector dividers are added the entire sector programming sequence will need to be repeated from step 1.

Site sector record

Recording the actual sector split positions will help in fault finding at a later date.

Sector End	Position (% of total fence length)	Feed 1 Current (Amps)	Feed 2 Current (Amps)	Fence Volts (kV)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
No Short	(Balance - Use *65#)			

Calibration

The ZM20 is factory calibrated and should not require adjustment for the life of the product. If however, certain components are replaced during repair the unit may need recalibration.

Clearing old calibration values using the keypad

If recalibrating a ZM20 which has already been calibrated, the existing calibration needs to be cleared. Execute the following steps.

- | | |
|--|--|
| 1. Type [Installer's Code] [*] [0] [#] | Enter programming mode |
| 2. Type [9][6][0][0]# | Clear the calibration for the feed fence voltage |
| 3. Type [9][7][0][0]# | Clear the calibration for the feed 1 fence current |
| 4. Type [9][8][0][0]# | Clear the calibration for the feed 2 fence current |
| 5. Type [9][9][0][0]# | Clear the calibration for the ground reference voltage |
| 6. Type [*] [#]. | Exit programming mode |

Calculating calibration values

- Connect a medium or large energiser (4 Joules or larger) to the "EHT In" and "Ground" terminals on the ZM20.
- Link the "Feed 1" to the "Feed 2" terminal using a link of thick wire.
- Connect a 100 ohm load resistor from the linked "Feed" terminals to the "Ground" terminal.
- Link the "Feed 2" terminal to the "Gnd Ref" terminal using a link of insulated wire.
- Connect an accurate electric fence voltmeter across the 100 ohm load.
- Turn on the energiser and arm the ZM20 either by using the keypad or a switch into "In1".
- Record the voltage displayed on the external voltmeter and the 4 readings (feed voltage, feed current 1, Ground voltage and feed current 2) displayed on the LCD display.
- Turn off the energiser and disarm the ZM20.
- The actual fence current can be calculated using ohms law.

$$\text{Current} = \text{Voltage} / \text{Resistance}$$

For this example, say the voltage measured by the external voltmeter was 7.0kV. This would make the total current flowing through the 100 ohm resistor 70 amps. The link from step 8 above means that the individual feed currents are ½ this or 35A each.

$$\text{Total Current} = 7000/100 = 70 \text{ Amps}$$

$$\text{Feed 1 and 2 current} = 35\text{A each}$$

- The formula to calculate the calibration factor is:

$$((\text{Actual Value} / \text{Displayed Value}) * 100) - 100$$

Entering new calibration values using the keypad (for our example)

- | | |
|---|--------------------------------------|
| 17. Type [Installer's Code] [*] [0] [#] | Enter programming mode |
| 18. Type [9][6][?][?][#] | Enter the feed voltage calibration |
| 19. Type [9][7][5][8][#] | Enter the feed 1 current calibration |
| 20. Type [9][8][?][?][#] | Enter the feed 2 current calibration |
| 21. Type [9][9][?][?][#] | Enter the ground voltage calibration |
| 22. Type [*] [#]. | Exit programming mode |