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iTrap
Wireless
Battery Powered
Long-Life
Security System

1	DOCUMENT REVISIONS	4
2	INTRODUCTION.....	5
3	CORE TECHNOLOGY.....	6
3.1	Core Technology Product Line Summary.....	7
3.2	Alarm Panel	8
3.3	Internal Speaker/Siren	10
3.4	Back-Lit LCD Keypad	11
3.5	General Purpose Transmitter	12
4	CUSTOM PRODUCTS.....	13
4.1	Window Shock Sensor.....	13
4.2	External Speaker/Siren.....	14
4.3	Key-Fob for Alarm Arming and Disarming.....	15
4.4	Siren/Strobe	16
4.5	DVR Interface	17
5	DETECTORS	20
5.1	Low Power Internal PIR	20
5.2	Smoke Detector	21
5.3	Low Ligature Window 'Break Out' detector.	22
5.4	Single Channel AX Beams	23
5.5	Dual Channel SL Beams	24
5.6	HX Range External PIRs	25
5.7	VX Range External PIRs	26
5.8	BX Range External Perimeter Protection PIRs	27
5.9	Redwall Range of External PIRs	28
6	COMMUNICATION CAPABILITIES.....	29
6.1	Communications Device	29
6.2	Primary Communication Path	29
6.3	Secondary Communication Path	29

6.4	Human Readable SMS Mode	29
7	STANDARD MESSAGES TRANSMITTED TO THE ARC.....	30

1 Document Revisions

Revision	Reference	Notes
Issue 1.0	27/08/2018	Initial Draft

2 Introduction

This document describes ***iTrap***, the wireless Security System offered by JDR Software. The system is based on tried and tested wireless technology, with a powerful microprocessor, and a simple approach to the design. The result is an Alarm system that is very reliable, simple to install and loaded with features. The JDR system is suitable for use indoor, outdoor, and on harsh environments such as building sites.

3 Core Technology

JDR Software develops a range of wireless security products, based on over 20 Years of experience in the Software, Electronics and Security industry. The main product line is based on feature rich, low power products that consist of separate items all communicating wirelessly using transceiver (two-way) wireless communications. JDRs systems communicates using the licence exempt 868 MHz frequency, and uses secure encryption and tamper detection techniques to prevent unauthorised interference with the system.

Our mission is to use tried and tested wireless technology, powerful microprocessors, and a simple approach to design.

The result is an Alarm system that is very reliable, simple to install and loaded with features. The JDR system is suitable for use indoor, outdoor, and in harsh locations such as building sites and scaffolding.

Installation time is at the fore-front of our designs, with wiring between devices eliminated, and the ability to run everything from internal batteries. The system shown on the demonstration board below is a complete system with speaker, siren, wireless keypad, PIR (indoor and outdoor), smoke detector, vibration detector, optical beams, and integral dialler. Extra peripherals are described in later sections of this document.



Figure 1: JDR Software Demonstration System

3.1 Core Technology Product Line Summary

This section covers the fundamental components that make up the alarm system. Each client usually requires a variation of the core product to suit their requirements.

Alarm Panel

The Alarm Panel is a battery powered unit, with in-built GPRS communicator for communication with the ARC and authorised users via SMS. No wiring needs to be carried out when installing the panel. All communication with the panel is via the two-way radio link. The alarm panel should be installed out of the way, as high as possible. There is no keypad or display on the panel itself. The panel is the brain of the system, and should ideally be located in an inaccessible location. This is because if individuals do force entry onto the site, then even if sensors, keypads and speakers are destroyed, then panel will remain in communication with the ARC.

Internal Speaker / Siren

This is a battery powered combined speaker and siren unit that uses approximately 30 pre-recorded phrases, as well as being able to generate a siren sound. These should be installed within a building, rather than being exposed to the elements. Communication with the panel is via the two way radio.

LCD Keypad

This battery powered keypad incorporates a 2x16 LCD Display for detailed feedback when interacting with the panel. The keypad can be used for arming and disarming, learning in new devices and viewing the detailed event log.

General Purpose Transmitter

A transmitter module is available, that can be configured to operate in a normally open or normally closed configuration. This can be used to connected the clients own detectors or devices to the main control panel.

3.2 Alarm Panel

The Alarm Panel is a battery powered, sealed unit which is capable of operating for up to two years on a single set of batteries (subject to the correct mode of operation). The panel contains an inbuilt communicator, for bi-directional communication with the ARC (via IP protocol) and also with appropriately authorised mobile phones using SMS.

The panel is waterproof, and can be installed indoors or outdoors. It is never necessary to open up the lid to the panel. All learning in of detectors and configuration of the system can be carried out using the wireless keypad.

Installation of the Alarm Panel is carried out in the following ways.

- i) The panel can be secured to a wall, using four screws.
- ii) The panel can simply be placed into a hidden location such as a roof-space
- iii) The panel can be attached to scaffolding using the optional back-plate¹.

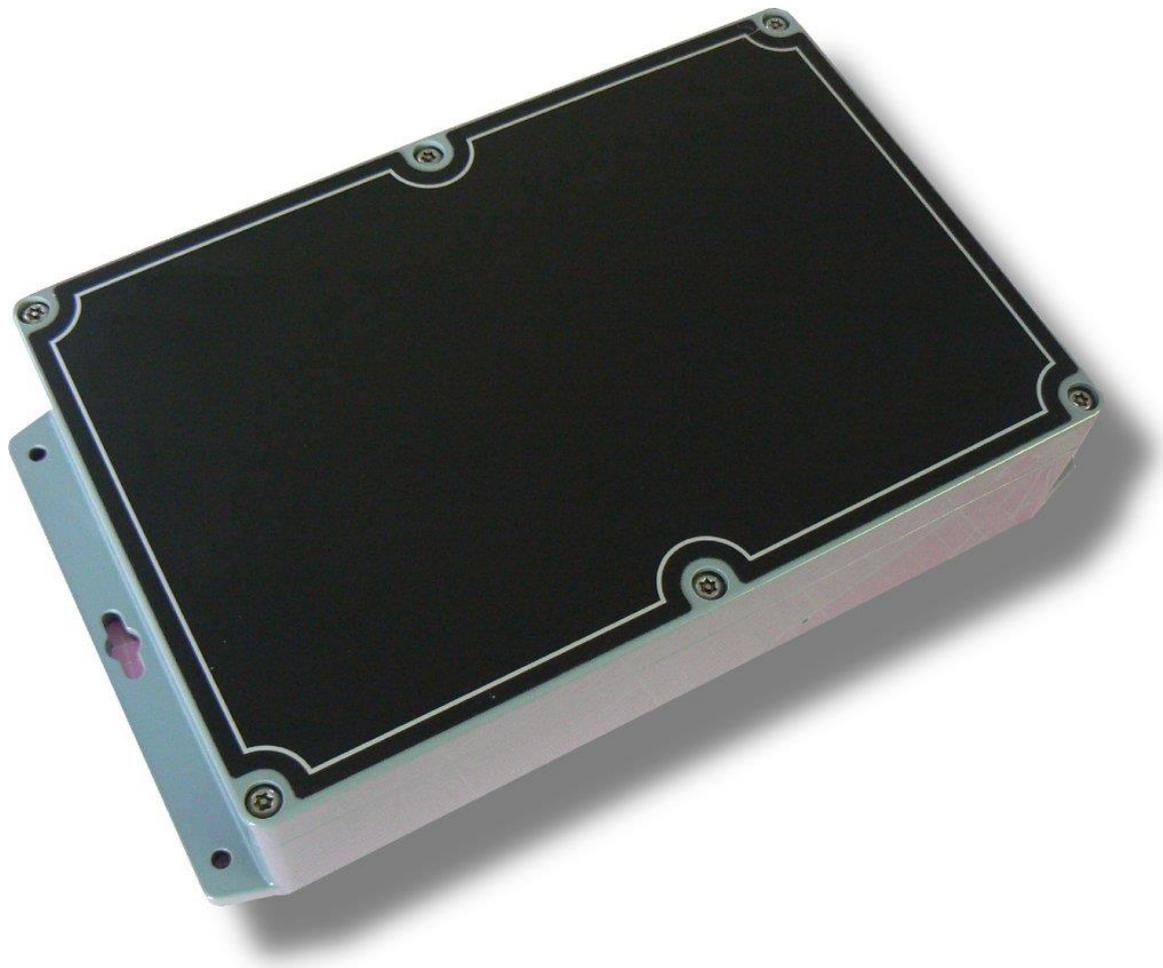


Figure 1: Alarm Panel

Alarm Panel Features List

- Supports up to 32 wireless detectors
- Battery Powered
- Supports early detection of masked sensors
- Alerts operators of masked sensors during setting
- For indoor or outdoor use
- Free Standing Use in hidden location
- Can be wall mounted via 4 screws
- Very fast to install
- No need to open panel during installation or learning
- Can be scaffold mounted, using optional back-plate.
- No wiring required, extremely robust.
- Inbuilt GSM/3G communicator
- SMS Reporting to up to 8 mobile telephones
- Can be controlled from mobile telephones via SMS sent to Panel
- Supports up to 32 individual CCTV channels (via wireless link to DVR)
- IP Communication to ARC
- Operates on low power 868 MHz narrow band frequency
- 2000 event log, with complete details on every event.
- Event log viewable via ARC, Keypad or Mobile Telephone
- Panel can be Set/Unset via :
 - Inbuilt Timer
 - Keypad
 - Key-fob
 - SMS command from mobile phone
 - Command from ARC

3.3 Internal Speaker/Siren

The internal speaker/siren should only be used within buildings or sheltered areas, or where the unit is protected from the direct effects of rain or snow. The speaker uses 30 pre-recorded phrases, which can be configured to trigger on first or second alarms. The phrases contain useful messages such as “This area is being recorded and monitored on CCTV. Please leave now.” This means that an immediate warning can be given to any intruders, before a ‘confirmed’ signal is sent through to the ARC, at which point the ARC personnel would take over.

In addition to the spoken phrases, then speaker/siren also generates a siren. The volume of the siren would be considered sufficient for use within a building, but for outdoor use, it would be advisable to use the External Speaker/Siren module, described in section 4.

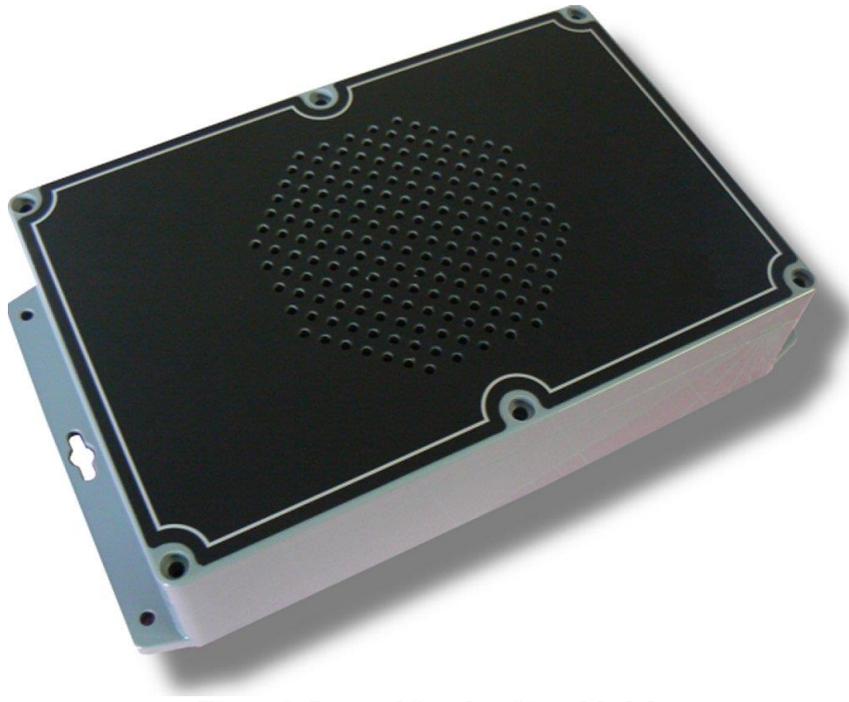


Figure 2: Internal Speaker/Siren Module

- Contains 30 pre-recorded phrases
- Also serves as a siren
- No wiring required, extremely robust.
- Can be screwed to a wall, or attached to Scaffolding (if under cover)
- Up to 8 speakers/sirens can be learned into an Alarm panel
- Operates on low power 868 MHz narrow band frequency
- Battery powered

3.4 Back-Lit LCD Keypad

The keypad is battery powered and incorporates a backlit LCD display. This display is used for setting and un-setting the panel, as well as configuring the Panel. The keypad supports up to 16 different user codes. When any action is taken using the keypad, the action is logged against the user code that has to be entered to unlock the keypad. The keypad is fitted with a vibration sensor and will report a suspected tamper if it is attached. Multiple attempts at trying to enter an invalid code will result in keypad lockout for 5 Minutes, as well as a signal being sent through to the ARC.

The keypad uses two way communication with the panel, so for example, when the system is armed using the keypad, the operator will have confirmation on the LCD that their command is being carried out.

The keypad is weather-proof, but should be mounted with some degree of direct protection from the effects of rain or snow.



Figure 3: Wireless Keypad

- Supports 16 User Codes
- 2x16 Character Back-lit LCD display
- User to learn in devices
- Can be carried around site when testing (see triggered sensor on LCD)
- Sealed membrane keypad
- Can be screwed to a wall.
- Up to 8 keypads can be learned into an Alarm panel
- Operates on low power 868 MHz narrow band frequency
- Battery powered

3.5 General Purpose Transmitter

This is a battery powered, waterproof transmitter, that can be used to interface third party devices to the alarm system. Any device that has a normally open, or normally closed set of outputs, can be connected to the General Purpose Transmitter.

This device would typically be used on magnetic window or door contacts, though it has also been used on other devices such as a "Panic" button, (shown below) as well as industrial micro-switches to detect when sliding doors have been opened and closed.

On another application, the transmitter was used to indicate when entry and exit barriers were raised or lowered.



Figure 4: General Purpose Transmitter, shown connected to Panic Switch

- Supports any device with NO or NC outputs
- Battery powered
- Water proof
- Can be used with magnetic door and window contacts
- Can be used with 3rd party switches

4 Custom Products

The following section describes some of the ad-hoc devices that have been requested and added to the range of available peripherals.

Window Shock Sensor

The proposal is to develop a compact shock sensor that can be embedded into the very framework of windows, or, can be securely attached to an existing window using two sided tape. The shock sensor uses an accelerometer to be able to differentiate between several different levels of impact.

External Speaker / Siren

This is a battery powered combined speaker and siren unit that uses an external horn type speaker, to announce approximately 30 pre-recorded phrases as well as generating siren sounds.

Key-fob

This battery powered key-fob can be used to arm and disarm the alarm system. Up to 16 key-fobs can be learned into a single system. Some key-fobs can be configured as being master key-fobs, meaning that they can be used to set or unset multiple alarm panels. Lost or stolen key-fobs can be deactivated remotely, either from the ARC or via an appropriate SMS text message sent to the panel.

Repeater

The battery powered repeater can be used to extend the range by approximately 250 Meters (in free space). Multiple repeaters can be used to increase the range indefinitely.

Siren/Strobe

The battery powered siren/strobe is for external use. Multiple strobes can be learned into the panel, and can be instructed to flash and sound for independently.

Scaffolding Back-Plate

A common back-plate is proposed which fixes easily to each device in, and has standard scaffolding clips on the back side. Most devices are already waterproof, and the addition of the Scaffold Back Plate makes this system at home in a building, on a building site or attached to scaffolding.

DVR Interface

The DVR interface is a mains powered device. This is the only mains powered device, but it will always be located next to the DVR itself, where mains is available. The DVR interface communicates with the alarm wirelessly. One DVR interface can control up to 16 channels on a DVR, and two DVR interfaces can be used if more than 16 video channels are required. The DVR interface connects to the DVR via a cable.

4.1 Window Shock Sensor

This is a compact shock sensor, embedded into the very framework of windows, or, securely attached to an existing window using two sided tape. The shock sensor uses an accelerometer to be able to differentiate between several different levels of impact.

The shock sensors have a configurable impact setting from 1 to 10, where 1 is a light touch, and 10 is a brutal impact. The facility exists to 'learn' in an acceptable level of impact. In this mode, the window will be struck, a number of times, at a force which would be deemed acceptable. From then on, any impact greater than this, would trigger an alarm.

4.2 External Speaker/Siren

This is an amplified, outdoor version of the Internal Speaker/Siren. It uses an outdoor horn type speaker, which would be mounted high up.

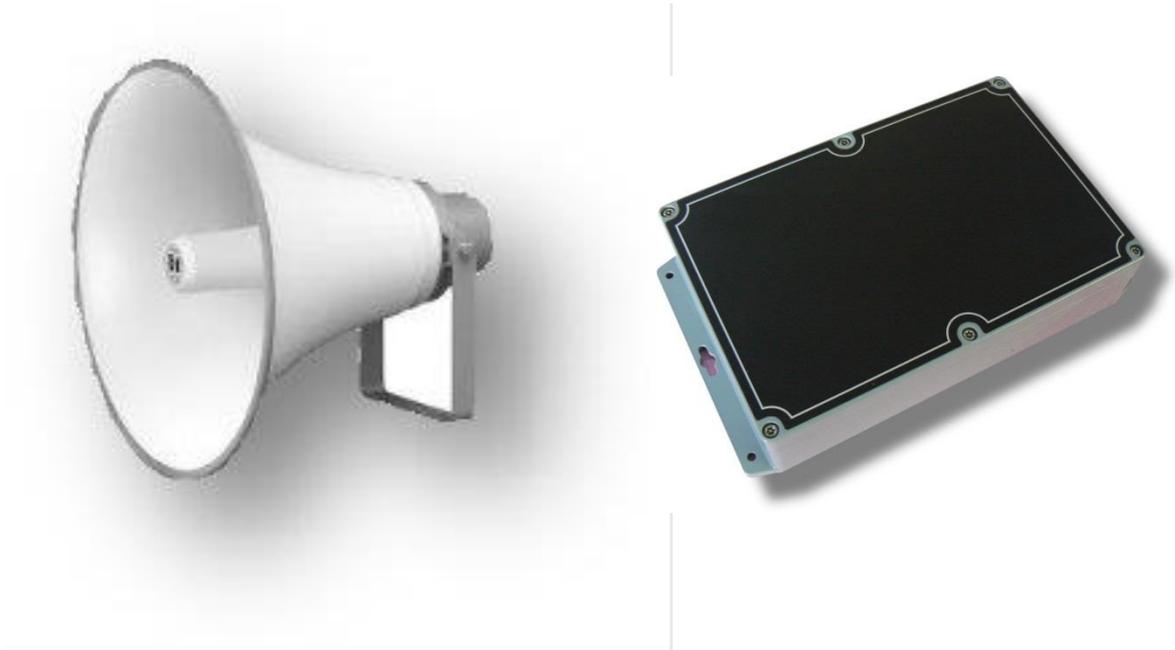


Figure 5: External Speaker/Siren and control box combination

- Waterproof
- Amplified sound levels
- Contains 30 pre-recorded phrases
- Also serves a siren
- No wiring required, extremely robust.
- Can be screwed to a wall, or attached to Scaffolding (if under cover)
- Up to 8 speakers/sirens can be learned into an Alarm panel
- Operates on low power 868 MHz narrow band frequency
- Battery powered

4.3 Key-Fob for Alarm Arming and Disarming

The key-fob is a compact key-ring tag -reader that can be used to set and unset the alarm panel. It would typically be mounted at the exit of the site, and could be one of the methods used to set the alarm.

Up to 16 tags can be learned into the system, some of which can be configured to act as “Master tags”. This means that the same tag can be used to set and unset multiple alarm systems. This would typically be used by quick response personnel, who would not necessarily have time to locate the correct tag for the correct site.

The tag reader device is a small battery powered device that is fixed near the exit location of the site. To set or unset the system, the hand-held tag is simply brought into the proximity of the reader.

Different colour tags are available, which could be used to allocate to Masters, Engineers, Managers and Operators.



Figure 6: Wireless Tag Reader and Hand-held Tag

The allocation (and removal) of tags from each alarm system can be remotely managed, so if a tag is lost or stolen, or falls into the wrong hands, it can be deactivated. If a deactivated tag is used to try and gain access to a site, then this can be configured to make the alarm send a signal to SMS and/or the ARC.

4.4 Siren/Strobe

The strobe and siren unit is battery powered, and is for external use. Up to 8 siren/strobes can be learned into the panel, and can be instructed to flash and sound for individually configured times.

The batteries and antenna are all mounted internally.

The strobe can be wall or scaffold mounted.



Figure 7: Siren/ Strobe

- Independent Siren and Strobe Times
- Fully tamper protected. Tampering or destruction will cause panel to signal ARC.
- Can be wall or scaffold mounted
- Up to 8 siren/strobe units supported per alarm panel
- Battery powered
- Completely wireless operation

4.5 DVR Interface

The DVR interface is a mains powered device. This is the only mains powered device in the product range, but as it will always be located next to the DVR itself, where a mains supply is available, this should not present any problems. The DVR interface communicates with the alarm panel wirelessly, meaning the Alarm panel can be mounted out of the way, and the DVR interface is simply an additional peripheral that can be wirelessly connected to the Alarm.

One DVR interface can control up to 16 channels on a DVR and up to two DVR interfaces can be used if more than 16 video channels are required. The DVR interface connects to the DVR via a cable.

The DVR interface can connect with any DVR that has Alarm input connections, which actually covers most of the DVRs on the market today. Not all DVRs support the IMMIX communication protocol, that may be needed to communicate with the ARC



Figure 8: 16 Channel Wireless DVR Interface

The Alarm panel will be able to map each detector to a specific DVR alarm channel, or, it can group a collection of alarm detectors into a group (called a “zone”), and then map the Zone to a single alarm channel.

The cameras already controlled by the DVR interface are shown below:



Figure 9: PTZ dome mapped to individual detector locations



Figure 10: Infra-Red camera mapped to individual detector



Figure 11: Camera mapped to detector, with second relay used for external spot light.

5 Detectors

A range of detectors (currently Optex) are currently available, which include single optical beams, dual optical beams, internal and external PIRs and wireless Redwall PIRs.

Our transmitters are very flexible and can be fitted to most third party detectors. The ones listed in this section are only the ones we have fitted out transmitters to previously, but the range can also be expanded quite simply.

5.1 Low Power Internal PIR



Figure 12: WNX PIR with 12M x 12M detection area

Detection Method	Passive Infrared and Microwave
Coverage	12m x 12m (40ft. x 40ft.) 85° Wide
Detection Zones	78 zones (PIR)
Mounting Height	1.5 - 2.4m (5 - 8ft.)
Sensitivity	2°C (3.6°F) at 0.6m/sec. (2ft./sec.)
Detection Speed	0.3 - 1.5m/sec. (1 - 5 ft/sec.)
LED Alarm Indicator	Switchable ON/OFF

5.2 Smoke Detector

The BRK SA710B smoke detector is a very low power internal photoelectric smoke detector, with integrated transceiver. Battery life is typically 2 Years.



For more information on the SA710B smoke detector, please see

<http://www.brkelectronics.com/product/SA710B>

5.3 Low Ligature Window 'Break Out' detector.

This low ligature detector is designed for use in safe rooms to detect either attempted break out or break in. Each individual device can be sensitivity controlled and monitored both remotely and locally as required.

Full sensitivity control allows you to alter the sensitivity of the system alarm according to suit the client characteristics and a hush function will mute alarms temporarily to allow clients time to settle.

The dome shaped enclosure fixes to glass with self-adhesive mounts.



5.4 Single Channel AX Beams

The AX wireless beams are single channel battery powered infra-red beams with up to 100 Meter beam range. The system communicates with the detectors 24/7, and can detect if a beam path is blocked, as soon as it happens – without having to wait until the alarm, system is set first> this means that if an obstruction would compromise the security of the site, this can be avoided within 10 Minutes of the obstruction being initially detected.

For more information on the AX range of single beams, please see

<http://www.optex.co.jp/e/sec/outdoor/photoele/ax100tfr-200tfr/index.html>



Figure 13: Single Channel AX Beam with up to 100 Meter beam range

5.5 Dual Channel SL Beams

The SL wireless beams are battery powered, dual channel beams with up to 100 Meter range. As with the AX beams, these SL beams can be placed back to back to produce a perimeter fence of any shape.

The Dual Beam devices have internal intelligence to eliminate false alarms and unnecessary ARC signal reports. Both beams need to be triggered consecutively in order to count as a valid intrusion.

For more details on the SL range of Dual Beams, please see:

http://www.optex.co.jp/e/sec/outdoor/photoele/sl-350qfr_350qnr/index.html



Figure 14: SL Dual-beams with up to 100 Meter beam range

5.6 HX Range External PIRs

The HX range provides stable and reliable detection in most harsh outdoor environments, where simple PIR detectors struggle to function. THE HX range has been fitted with the JDR transmitter, to provide a battery powered PIR from a leading supplier.

For more details on the HX range of PIRs, please see:

<http://www.optex.co.jp/e/sec/outdoor/pir/hx40dam/index.html>



Figure 15: HX Range of Optex PIRs fitted with JDR Technology

5.7 VX Range External PIRs

The VX range provides an innovative solution to external area detection. It employs a highly reliable dual detection technique, which prevents false activations caused by small animals and birds. Two discrete detection areas are created and only when an intruder is detected inside both areas is an alarm output triggered. Double Conductive Shielding ensures that the sensor is resistant to interference from foreign light sources such as the sun and car headlights.

For more details on the HX range of PIRs, please see:

<http://www.optex.co.jp/e/sec/outdoor/pir/vx402/index.html>



Figure 16: VX Range of Optex PIRs fitted with JDR Technology

5.8 BX Range External Perimeter Protection PIRs

With long, narrow detection areas that extend from both its sides the BX-80N is specifically designed to be wall-mounted centrally on a building, covering the building perimeter with a multi-layered, horizontal barrier that detects intruders before they break in. To help reduce false activations, the range can be adjusted so that detection extends only to the end of the building. The unit also has a size-judging function, which helps it discriminate between large and small objects within the detection area.

Completely wireless, and battery powered, this perimeter detector complements the JDR range of detectors.

For more details on the BX range of perimeter protection PIRs, please see:

<http://www.optex.co.jp/e/sec/outdoor/pir/bx80n/index.html>



Figure 17: BX Range of Perimeter Protection PIRs

5.9 Redwall Range of External PIRs

Battery powered, wireless, outdoor PIR detector for mid-sized outdoor areas, designed to enhance CCTV applications, 30mx20m coverage

Features:

- 30mx20m detection coverage
- intelligent PIR detection system
- automatic sensitivity management to ambient temperature and light
- advanced detection algorithm
- three dual pyro-elements with patented Double Conductive Shielding
- anti-vandalism functions including anti-masking and anti-rotation function
- 2.3m to 4m mounting height
- independent sensitivity for near and far detection zones
- detection logic selector
- adjustable alarm interval time
- BS8418 compliant (UK)

For more details on the Redwall range of PIRs, please see:

<http://www.optex-europe.com/products/redwall/>



Figure 18: Redwall Range of PIRs

6 Communication Capabilities

With over 20 years' experience developing and implementing security system communication protocols, we are sure that we can offer a communication medium and protocol that will allow messages to be received by your call handling centre, ARC, or even one 'man in a van'.

6.1 Communications Device

The heart of the alarms communications is based on a 3G GSM module. The antenna and SIM card are internal to the alarm enclosure.

Messages are sent to and from the ARC using two methods.

6.2 Primary Communication Path

The primary communication path is via GPRS, sending IP based packets to the ARC using industry standard protocols. Where very specialist payloads are required, JDR supplies a PC based software application which runs within the ARC. This software allows data packets to be sent to and from the Alarm panel, without having to make modifications to the existing Alarm receivers. This method is currently in use at two large alarm receiving centres.

Where standard messages are required, such as set, unset, first alarm, second alarm etc. are required, standard IP packets can be sent into applications such as Sentinel.

Two IP addresses are provided, these being a primary and a backup. If a successful communication cannot be established on the primary communication path, then message transmission is attempted on the secondary IP address.

6.3 Secondary Communication Path

If no IP connection could be established on either the primary or the secondary IP address, then the event can be sent via SMS. This can be an SMS to either an online SMS receiving service, or to a standard mobile phone.

6.4 Human Readable SMS Mode

Not all users have access to, or the need for, an Alarm Receiving Centre. In this case, the panel can be set to work in "Human Readable Mode". This means that standard SMS messages can be sent to up to 4 telephone numbers. The messages are formatted in a readable format such as "**Joe Blogs Limited. Alarm activated, Zone 4**". Not only can messages be sent via SMS, but it is also possible to send messages to the Panel from the phone. For example, the panel can be set and unset, any of the 32 individual detectors can be omitted (temporarily ignored) or reinstated (made active again), and even the event log can be viewed for the last 8 events.

7 Standard Messages Transmitted to the ARC

Event	Description
Alarm	Includes 1 st or 2 nd alarm, and individual zone identification
Fire	Includes individual zone identifier
Flood	Includes individual zone identifier
Panel Tamper	Specific event for panel tamper
Siren Tamper	Specific event for siren tamper
Keypad Tamper	Specific event for siren tamper
Device Tamper	Includes device type, and type of tamper, and zone
Tamper Restore	Includes device type and zone number
Device Supervision Fail	Includes device type and zone number
Device Supervision	Includes device type and zone number
Speaker Supervision Fail	Specific event for speaker supervision
Speaker Supervision Restore	Specific event for speaker supervision
Keypad Supervision Fail	Specific event for keypad supervision
Keypad Supervision Restore	Specific event for keypad supervision
Panel Armed (Set)	Panel has been set, by stated method
Panel Armed with Omits	Panel has been set. Omitted zones are also sent.
Panel Disarmed	Panel has been unset
Panel Rearmed	Panel has automatically rearmed
Wrong Codes	Too many wrong codes were entered on the keypad
Panel powered up	Panel has had batteries inserted
Panel suspended	Panel has been put into ultra-low-power sleep mode
Panel woken	Panel has been woken into normal operational mode
Low device battery	The battery level, device type and zone number is sent
Low Panel battery	The battery level is sent
Low Speaker Battery	The battery level is sent
All devices deleted	All devices (zones) have been deleted
Device Learned In	Device type, and location is also sent
Device Deleted	Device type, and location is also sent
Speaker Learned In	Specific message for speaker
Speaker Deleted	Specific message for speaker
Keypad Learned In	Specific message for keypad
Keypad Deleted	Specific message for keypad
Manual Test Call	Test call initiated from panel, keypad, SMS or ARC
Automatic Test Call	Up to 2 test calls a day can be schedules
Clock moved forward (BST)	British summer time confirmation
Clock moved back (BST)	British summer time confirmation
Alarm Error	Diagnostic event code
Device Omitted Confirmed	Manual request to omit device confirmation
Device Reinstated Confirmed	Manual request to reinstate device confirmation
Alarm Silent Confirmed	Request to silence the alarm confirmed
Alarm Audible Confirmed	Request to allow audio confirmed
Tampers Disabled Confirmed	Request to disable tampers confirmed
Tampers Enabled Confirmed	Request to enable tampers confirmed
User Code Change Confirmed	Single user code has been changed
Many Codes Change Confirmed	Multiple user codes have been changed
Door Time Changed	Time on electronic door lock changed manually
Door Status	Electronic door is open/closed/locked/unlocked etc.
Door Powered Up	Door has had batteries inserted
Door Wrong Code	The wrong code has been entered on the door
Door failed to close	The door was not closed properly

Door forced open	Door was opened without using handle
Door retract failed	The electronic lock could not unlock the door
Door retract failing	The electronic lock took a long time to unlock the door
Door extract failed	The electronic lock could not lock the door
Door extract failing	The electronic lock took a long time to lock the door
Door Internal Lock	The door was locked from the inside
Door Internal Unlock	The door was unlocked from the inside
Door code changed	A door access code was changed
Door Vandal Attack	Door is detecting violent shocks
Door ARC Code changed	The ARC has successfully changes a door code
Door Temp Code Change	A temporary door code has been changed.
Door Unlocked by ARC	The door was remotely unlocked by the ARC
Door Unlocked by Keypad	The door was unlocked via the keypad
WPU enabled	The remote downloader has been activated
Reset Codes	All user codes have been reset