WINKELMANN
A MATTER OF NATIONAL SECURITY

Product Application Notes

www.winkelmann.co.uk

Welcome

Winkelmann is a global provider of specialist search equipment, communications security and technical surveillance countermeasures (TSCM), we are the proven and trusted partner of government agencies, armed forces and alliances (including NATO).

Winkelmann has experience in delivering comprehensive equipment programmes supported by appropriate through life training and provision of TSCM technical capability to government and special force units worldwide from concept and planning stage through to project completion.

A key priority for the company is to provide consistently cutting-edge counter terrorism solutions that not only offer the highest levels of performance but continuously evolve to meet the changing requirements of our customers around the world.

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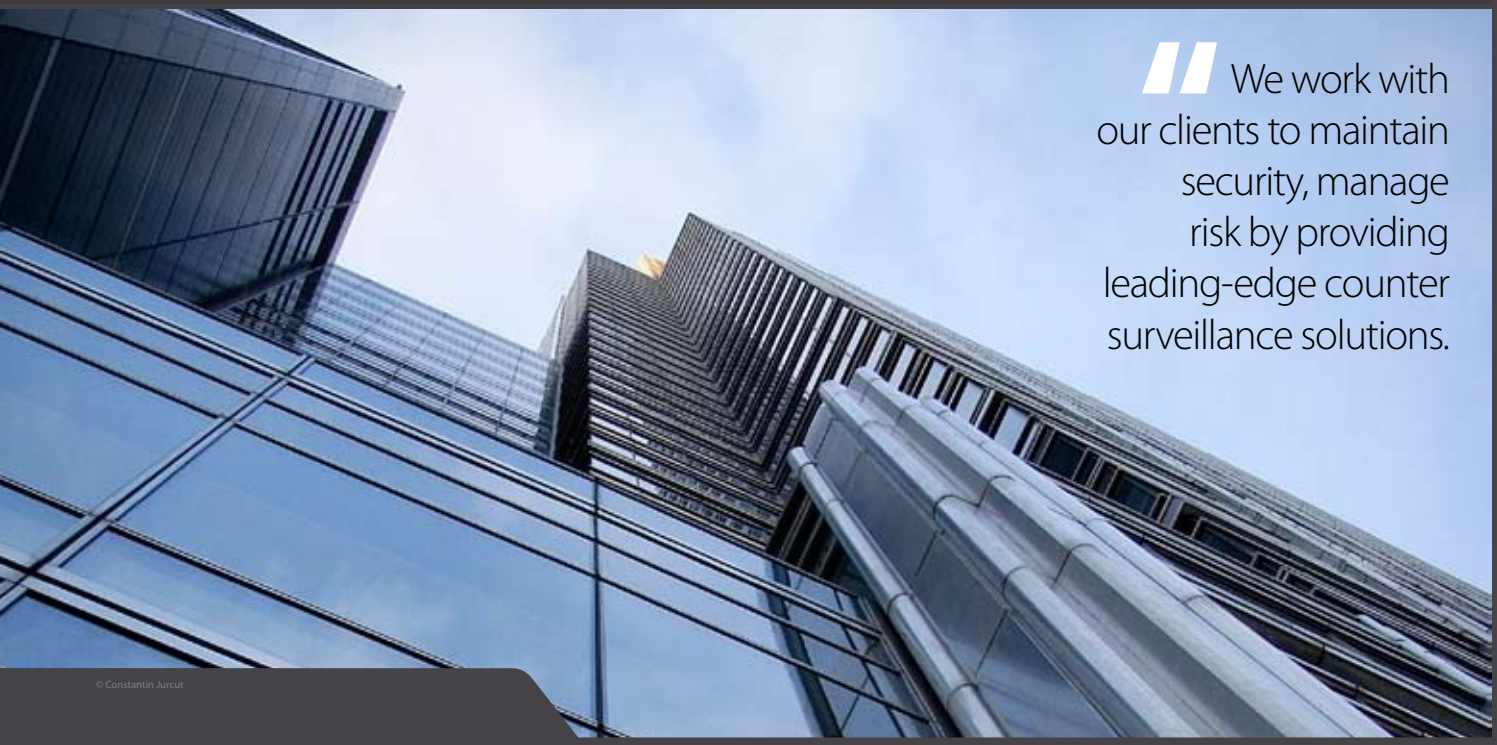
Applications for RAPTOR RXi Counter Surveillance Receiver

Key Applications

- Technical surveillance countermeasures (TSCM)
- Spectrum monitoring and interference mitigation
- Radio monitoring and enforcement by regulatory government authorities

Applications for RAPTOR RXi Counter Surveillance Receiver



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Winkelmann's new TSCM spectrum analyser solution has been developed in response to increasing market demand for a reliable system that has the capability to detect threat signals (bugging devices) in today's crowded spectrum.

One of the main objectives of the RAPTOR RXi is to detect and identify new signals. "New" signals can be RF surveillance devices, unlicensed stations or unwanted signals such as interference.

Searching for "threat" transmitters is increasingly like "looking for a needle in a haystack". However, the RAPTOR RXi provides the tools to look through this "haystack" and find "threat" transmitters simply and reliably. The Raptor RXi Counter Surveillance Receiver scans from 10kHz to 26GHz in under 4s, detecting even the briefest pulsed transmissions. Featuring a fast Core 2 Duo processor, its multiple software tools and demodulators detect frequency-hopping, burst mode and spread spectrum devices as well as analogue audio and video signals. Two spectrum analyser windows allow the user to simultaneously view the whole spectrum and zoom in on individual frequencies. The 'Waterfall' display mode gives an intuitive display of signals over time. The Raptor is as a portable device, allowing reference scans to be easily run in different areas of a building, operating either from an internal rechargeable battery or an external supply. Its integrated antenna system provides excellent wideband performance from 10kHz to 26GHz.

Technology

The system contains a full-feature Core 2 Duo PC running Windows 7 and a state-of-the-art receiver (designed by Winkelmann). The receiver uses an analogue front end, combined with software filtering and demodulation to provide the best combination of fast scan speed and receiver performance. This design enables the system to sweep extremely fast; the software provides a wide range of analysis tools for the detection and location of bugging devices. The user interface has been carefully designed to be simple and intuitive; the spectrum analyzer display shows the entire spectrum in one graphical window with the facility to zoom in on areas of interest. A separate zoom window allows the user to simultaneously look at areas of the spectrum in high-resolution mode. Displays spectrum as a list or graphically. Facility to compare lists or graphs sampled in different locations, plus allows user to zoom over the spectrum without any interruption at even 20MHz.

Applications for RAPTOR RXi Counter Surveillance Receiver

Technical surveillance countermeasures (TSCM)

TSCM is defined as the gathering of any information using audio, visual, or technical attack methods leading to loss or unauthorised disclosure of data or information.

To ensure confidentiality a technical surveillance risk assessment should be carried out and recommendations should be implemented when considering information security and business continuity arrangements.

The Raptor RXi is intended to analyse and monitor the radio frequency spectrum in electronic countermeasure operations. Radio transmitting devices are probably the most popular types of eavesdropping device.

They are readily available, relatively cheap, and widely advertised. In addition, information on eavesdropping attack methods are now readily available on the internet.

The Raptor RXi is a portable device, allowing reference scans to be easily run in different areas of a building. The system quickly identifies localized RF transmissions of all types of modulation over the entire frequency spectrum.

Spectrum monitoring and interference mitigation

The Raptor RXi is an all-in-one spectrum monitoring solution for detecting all types of communications signals using any modulation and transmission method.

The Raptor RXi provides reliable detection of radio interference caused by defective electronic equipment. Monitor RF bands to determine compliance with local laws and regulations. Monitor assigned frequencies to look for interfering signals or to determine if your transmitters are working properly. Fast and effective elimination of interference sources, e.g. at airports.

Radio monitoring and enforcement by regulatory government authorities

The Raptor RXi from Winkelmann can be adapted by users to carry out specific radio monitoring tasks (for internal and external security) as well as spectrum management tasks.

Monitoring of a large number of radio services or an organisation's own emissions in an assigned service band. Continuous monitoring of an emergency channel during operation as well as broadband spectrum scanning. Government spectrum licensing monitoring and enforcement.

Applications
for HAWK XTS & SEARCHER-2500 Non Linear Junction Detector

Key Applications

- IED search (detection of improvised explosive devices)
- Technical surveillance countermeasures (TSCM)
- Mail screening for concealed electronic devices (suspect packages)

Applications for HAWK XTS & SEARCHER-2500 Non Linear Junction Detector

The HAWK XTS is lightweight, utilizes modern technology shaped to allow easy handling; single-body design containing transceiver, antenna and display assembly on a single extendible unit.

A Non-Linear Junction Detector has the ability to detect electronic devices containing semi-conductors including diodes, transistors, IC's, microprocessors, microcontroller, triac, power devices and bi-metal junctions.

The HAWK XTS is a portable, simple to use advanced electronic device detector, also known as a Non-Linear Junction Detector (NLJD). The HAWK XTS hand-held system includes automatic frequency selection & automatic power control to prevent saturation of targets and provide more accurate analysis. Rapid development of lithium technology means batteries for the HAWK XTS system will last longer, up to 4 hours operation on a single fully charged battery. During the life of the HAWK XTS it may be deployed on a range of domestic operations such as technical surveillance countermeasures (TSCM), sweeps and noncombat operations such as peacekeeping missions, and on civil emergency tasks, where it can provide RCIED/IED search-and-support to react to terrorism threats.

The SEARCHER-2500 is the most compact handheld Non-Linear Junction Detector available on the market today

Technology

The HAWK XTS NLJD is used for the detection of electronic circuits commonly found in IEDs and radio transmitters. Most sophisticated electronic circuits contain semi conductors, which are non-linear junctions. The HAWK XTS can find these by emitting a very high frequency signal which simulate the non linear junction into emitting harmonic signals at two and three times the fundamental frequency.

The XTS contains two highly sensitive receivers to pickup these harmonic frequencies and indicates the proximity of the device by means of a visual and audible alarm.

Applications for HAWK XTS & SEARCHER-2500 Non Linear Junction Detector

IED search
(detection of improvised explosive devices)

One of the greatest areas of concern to soldiers in the field is that of radio controlled improvised explosive devices (RCIEDs), which kill more soldiers in modern warfare than any other weapon system.

Such devices are also being increasingly used by terrorist organisations and other subversive groups to target civilian VVIPs and their vehicle convoys. Winkelmann has nearly two decades of experience in developing NLJD's and has delivered over 2500 units to Military & Government agencies. Over the past few years, NLJD's have played an important role in detecting improvised explosive devices, this has fuelled the latest research, ideas and growth, and technology delivery.

The HAWK XTS-900 is capable of locating and confirming the presence of electronic components found in devices, regardless whether they are switched on or off. The HAWK XTS-900 allows the operator to search voids and areas where they are unable to gain physical or visual access, in order to detect electronic components and determine if the area is free from an Improvised Explosive Device (IED). The lower frequency of the HAWK XTS-900 detector has an advantage of detecting devices in the ground. The lower the frequency, the better the penetration in the ground.

Technical surveillance countermeasures
(TSCM)

TSCM is defined as the gathering of any information using audio, visual, or technical attack methods leading to loss or unauthorised disclosure of data or information.

The HAWK XTS-2500 is capable of locating "bugging" devices even if they are switched off behind plaster board, concrete or brick walls, steel and glass. TSCM sweeps can be monotonous, repetitive, and stressful in certain environments, non-linear junction detection is an extremely powerful search technique in addition to normal physical search procedures.

The higher frequency of the XTS-2500 detector has an advantage on well-screened targets such as mobile phones and similar devices. The smaller waveform at 2.5GHz makes it more likely for the signal to get through gaps in the screening enclosure of the electronic device.

Mail screening for concealed electronic devices
(suspect packages)

The SEARCHER-2500 is the most compact handheld non-linear junction detector available on the market today. It has been designed to the very highest standards, in terms of functionality, ease of operation and reliability.

Used for checking suspect packages for electronic devices such as mobile phones, digital recorders, cameras and high value electronics.

Applications for Specialist Visual Search Products

Key Applications

- Contraband Search
- Technical Surveillance Countermeasures (TSCM)
- Improvised Explosive Device (IED) Search
- Search and Rescue
- Tactical Search, Special Task Forces
- Industrial Remote Visual Inspection
- VIP Search, Physical Security and Inspection

Applications for Specialist Visual Search Products

> Our aim is to offer customers worldwide a range of quality, cost effective systems that are designed for specific applications.

Winkelmann provides the government, military and security markets an innovative and pioneering portfolio of remote visual inspection products. Our videoscopes and endoscopes are used on a daily basis in challenging environments including conflict zones around the world.

Our aim is to offer customers worldwide a range of quality, cost effective systems that are designed for specific applications. We offer highly portable, robust, intelligent remote imaging solutions featuring a host of advanced, intuitive features making them the ideal choice for remote visual inspection.

Endoscopes allow an operator to illuminate and view inside a cavity by drilling a small hole or accessing a cavity through an existing opening. This speeds up the search process and greatly reduces damage and repair costs that would result from the normal destructive opening of the cavity.

Flexible endoscopes (fiberscopes) are adopted by most search teams as they allow easy introduction into a cavity, have tip articulation and can travel along bending ducting, such as cable conduit. Given the tactile articulation control, the distal end tip can easily, quickly and accurately be manoeuvred into any position.

The EOD IV Multi Swing Prism Rigid Endoscope (Borescope) offers a low cost solution for some applications where direct access is possible. The multi swing prism allows prograde (forward) or retrograde (backward) view during the inspection without the need for changing the scope.

The EOD V Flexible Endoscope (Fiberscope) is a product that allows an operator to view down an eyepiece whereas the EOD VII Explorer Videoscope and EOD VIII Tactical Videoscope use a micro camera and an image is displayed on a screen which provides less strain on the user and allows more than one person to view the area under inspection at the same time.

Images can be recorded on all systems using an optional digital camera on the borescope/fiberscope or frame grabber on the videoscope.

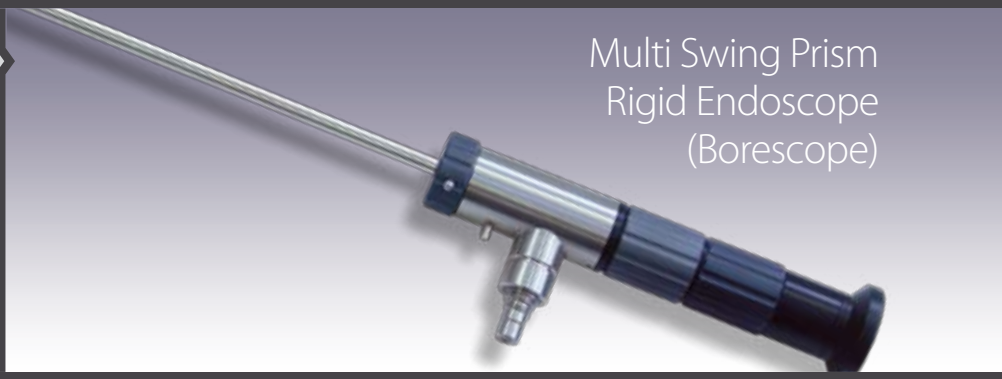
There are many different areas where these products can be used in search operations including buildings, vehicles, aircraft, trains, containers and freight.

Winkelmann Specialist Visual Search Products

EOD IV

Applications

- High resolution images for viewing directly by eye
- Low cost solution where straight access possible
- Basic search
- Research & development
- Industrial remote visual inspection (RVI)



Multi Swing Prism Rigid Endoscope (Borescope)

Flexible Endoscope (Fiberscope) Search Kit

EOD V

Applications

- Traditional flexible instrument for viewing directly by eye
- High resolution images with 2-way tip articulation
- Very compact and flexible
- Suitable for all security applications
- Research and development
- Industrial remote visual inspection (RVI)

EOD VII

Applications

- High spec videoscope with screen viewing
- Port security (inside the compartments of metal walls of 20ft & 40ft containers)
- General search requiring longer lengths
- Turbine blade and wave guide inspection
- UV curing and crack detection (NDT)
- Aircraft and ship inspection & maintenance
- Search and rescue
- Research and development
- Industrial remote visual inspection (RVI)

Explorer Videoscope System

Tactical Videoscope System

EOD VIII

Applications

- Portable and compact videoscope with screen viewing
- Reduces operator fatigue
- Allows more than one operator to view
- Suitable for all security applications
- Tactical search, special task forces
- Industrial remote visual inspection (RVI)

EOD IX

Applications

- Specially designed for Tactical attack groups
- High resolution images with 4-way tip articulation
- General search
- Covert search
- Covert surveillance
- Includes rigidiser tube and under door viewer

Tactical Search Kit

Contraband Search

Customs and Police use specialist visual search products for searching any location for drugs and contraband. Endoscopes & Videoscope systems save precious time and allow operators to inspect cavities previously inaccessible to view.

Examples: the internal inspection of car door panels, searching inside the metal wall compartments of 20ft and 40ft containers, viewing inside locked garages for stolen property or vehicles etc. Any of our EOD range can be used for these applications in helping customs, border agencies and police.

Technical Surveillance Countermeasures (TSCM)

To maintain the security of Government or Corporate buildings and vehicles, it is necessary for special teams to search for listening devices or covert CCTV systems.

After the detection of an electronic bug using the Raptor RXi (spectrum analyser) or Hawk (non-linear junction detector), an endoscope can be used to view in the suspected cavity containing the device with minimal damage. This can be in any area such as ceiling voids, cabling ducts, under floor areas, ornaments, artefacts and furniture. The EOD IV multi swing prism rigid endoscope, EOD V flexible endoscope search kit and EOD VIII tactical videoscope system are ideal products for this application due to their portability and flexibility.

Improvised Explosive Device (IED) Search

During military operations, VIP visits, heads of states summits and major conferences, security forces need to search venues and transport for possible terrorist bombs.

This task is carried out by military engineers, bomb technicians and police search teams. Endoscopes are an indispensible tool used to assist operators in searching cavities and other inaccessible areas or suspect packages for improvised explosive devices (IED's).

The EOD IV multi swing prism rigid endoscope or EOD V flexible endoscope search kit are ideal products for this application due to their portability and flexibility.

Applications for Specialist Visual Search Products

Search & Rescue

During the tragic times of disasters, especially earthquakes and landslides, the use of longer videoscope equipment provides rescue forces with the ability to view into cavities of fallen buildings and collapsed tunnels in the search for trapped people.

The EOD VII explorer videoscope system with working length up to 7.5m is ideal for this application. The integrated 24W powerful light source provides bright razor sharp images even in deep cavities.

Tactical Search, Special Task Forces

Both videoscopes and fiberscopes can be used without the illumination function for covert observation in rooms.

Winkelmann offer the specialist EOD IX tactical search kit which incorporates a lightweight portable videoscope and rigidizer that converts the videoscope into a pole camera, also included in the kit is an underdoor viewer which connects to the videoscope monitor. Providing there is some ambient light in the room the sensitive CCTV cameras will allow views to be obtained. This is a powerful kit which provides operators with an inspection system in a single compact case for their search and covert surveillance operations.

Industrial Remote Visual Inspection

Applications include inspection of gas turbines, aircraft, weapon barrel inspection and research/development applications.

All industries use remote visual inspection products including aerospace, petro chemical, power generation and automotive. RVI is an established and valuable technique for quality control, maintenance and troubleshooting applications. The EOD range can be applied to these applications with the exception of the special EOD IX tactical search kit.

VIP Search, Physical Security & Inspection

There is a wide range of applications in the use of remote visual inspection equipment for VIP security.

Applications
for Fiber Optic Microphones SOM3/SOM4/SOM5

Key Applications

- Security
- Industrial
- Oil & Gas
- Power Utilities
- Medical/MRI

Applications for Fiber Optic Microphones SOM3/SOM4/SOM5

Winkelmann manufactures a wide variety of fiber optic microphones, suitable for a broad range of settings and applications. All of our microphones are engineered to the most demanding environment and safety requirements. Being completely passive, they are ideal for locations and applications where conventional microphones and sensors cannot be used.

Today, KINGFISHER high performance microphones provide a complete set of solutions for law enforcement, industry, medicine, power generation, energy production, instrumentation monitoring and public safety.

Technology

Winkelmann's core platform blends the natural physical intelligence of optics and acoustics.

It's built around a tiny MEMS membrane and two optical fibers.

When acoustic waves impinge on the membrane they cause it to vibrate, changing the intensity of light that is reflected from incoming to outgoing fibers. This mechanism detects even the slightest changes in membrane displacement, with resolutions at a fraction of an Angstrom. Such precision translates to clear sound and low self-noise, and produces exceptional microphone performance.

Kingfisher System Components

Each SOM is delivered as a complete, plug-and-play system comprised of our advanced optical microphone attached to 10 meters of fiber optic cable, electro-optical unit, audio cable, DC power supply and carrying case.

The SOM system is purely analog with standard line output. It does not require any additional pre-amplifiers or amplifiers. Each microphone is calibrated individually to its nominal performance specifications at the factory, and is guaranteed to perform flawlessly throughout its lifetime. A wide selection of cable types and optional accessories is available.

Winkelmann Fiber Optic Microphone Products

SOM3/4/5

Basic fiber optic microphone

SOM3/4/5SPL

For monitoring acoustic signals with high Sound Pressure Levels (SPL) up to 140 dB

SOM3/4/5EXF

For monitoring acoustic signals with extended frequency range

SOM4/5EXTF

For operation over an extended temperature range

SOM4STE

Stereo fiber optic microphones with extended frequency range

SOM4/5SNREXTF

High SNR for long distances and demanding applications plus optional extended frequency & temperature

SOM5ISEXF

Ruggedized infrasound fiber optic microphone with extended frequency range

SOM5WP

Fully sealed fiber optic microphone for remote monitoring applications with humid/wet/sea environments

Differences between **SOM(3), SOM(4) & SOM(5)**

EOU100

The **SOM(3)** is supplied with extremely compact electro-optic unit (EOU100). It features a pair of ST-style fiber optic connectors; a 3.5mm socket for analog output & green LED voltage indicator. Unit is powered by external DC power supply.

EOU200

The **SOM(4)** is supplied with enhanced electronics box, electro-optic unit (EOU200). It features two analog outputs (one with volume control for headphones, another with fixed gain for monitoring equipment); one pair of ST-style fiber optic connectors; two 3.5mm sockets (one for analog output, another for headphones); green/red LED voltage indicator. DSP model (EOU250) provides up to 22dB of real-time ambient noise removal (three levels: low, mid, high). Unit is powered either by internal battery or external DC power supply.

EOU300

The **SOM(5)** is a ruggedized fiber optic microphone supplied with enhanced electronics box, electro-optic unit (EOU200).

Security

In overt or covert security surveillance, whether used as a back-up device supporting other overt recording technology, or as a concealed covert device, the combination of innovative optics and acoustic technology with advanced signal processing and conditioning has produced a device with many advantages over more traditional approaches.

The recordings achieved are of sufficient quality to be admissible as evidence in legal proceedings if required. For applications where evidence gathering is the primary objective, the high quality of the captured sound recording and the wide coverage achieved by the unit make it a very useful addition to the equipment portfolio.

Typically, the fiber optic microphone can be unobtrusively mounted to casino tables, installed in offices where fraud is suspected, can be used as a covert back up for interview recording and so on – the possibilities opened up by the technology of the fiber optic microphone are endless.

Industrial

Well established as an ideal technology for acquiring measurements in harsh environments, photonic sensors are tolerant to extreme temperatures, EMI, shock and vibration, and resistant to corrosion.

Optical fiber-based sensors are also lighter, more accurate and more versatile than conventional instrumentation. Typical applications include; monitor acoustic equipment during electromagnetic compatibility testing & test immunity with devices inside a GTEM cell.

Oil & Gas

In an industry where even the smallest gas leak or equipment fault are life-threatening and costly, engineering managers demand sensing systems that reduce hazards, increase efficiency and are easy to install and maintain.

Only photonic-based systems can effectively meet these tough demands. They are completely passive and free of metal and electronics which could cause explosions and interference, they can endure the most extreme environments, they are especially compact, and they are simple and reliable. Typical applications include for gas analysis in harsh industrial applications & measuring static pressure changes.

Applications for Fiber Optic Microphones SOM3/SOM4/SOM5

Power Utilities

With critical equipment worth many millions of dollars and a long, demanding supply chain, power generation facilities are on a constant vigil for early warnings.

When equipment fails unexpectedly, it can be a direct hit to the bottom line. When equipment performs poorly, it can be bad for the environment. Our photonic-based systems make pre-emptive performance monitoring smart, reliable and economical. Because their sensor heads are free of electronics, the systems don't cause interference with strong EM fields. Their non-metallic fiber optic cable also makes them completely safe for monitoring high voltage parts in power generators. Optical sensors also reduce costs of installation and maintenance, because they don't require explosion-proof conduits or containment.

Medical/MRI

The fiber optic microphone is among the most exciting developments in recent years for medical resonance imaging environments, solving one of the most challenging MRI problems – hearing the patient.

MRI operations produce acoustic noise levels as great as 130 dB, as well as very high electromagnetic and radio frequency noise.

These noises are not just discomforting to the patient, they render standard microphones useless for simple patient communications.

Our line of FOMRI advanced noise canceling optical microphones can be used in combination with any noise reduction headset to enable simple, crystal-clear verbal communications once again between the patient and MRI staff, and between MRI operators.

Typical applications include measurement of the noise within the head of an MRI scanner, frequency response tolerances, and the level of distortion at the specified maximum acoustic sound pressure. ■

Advantages of the Fiber Optic Microphone over Conventional Microphones

- The optical part does not contain metal nor active components; therefore it cannot be detected by conventional methods
- Does not contain metal and is completely passive, therefore is immune to EMI/RFI
- It can work in high humidity and extreme temperature conditions, long operational life. High reliability and environmental stability
- Optional extension tube for concealment and better installation through walls and objects
- Small, lightweight MEMS design produces excellent sound accuracy, high audio clarity and sound clarity
- Optical fiber connection over extended lengths, over 1Km, without signal loss. High SNR over long distances

Additional product lines

Communications Security

Cellular Detector GSM 196

The GSM196 monitors the (E)GSM900, GSM1800 and WCDMA/UMTS 2100(3G) bands. It is designed to detect the presence of unauthorised mobile phones and then help locate them.

BLOCKPHONE Cellular Jammers

Blockphone is a range of products designed to block mobile phones and prevent all cellular transmissions, without interfering with other communication systems. Several BlockPhone devices may be installed in one location to increase the operating range.

Stethoscopes
(through-wall listening devices)

Stethoscopes are used in surveillance applications for listening through walls, doors, windows or other obstacles. They are applied when the only possible way to listen to people in a room is from the outside or when people are trapped in a collapsed structure. This could be for permanent installations, when concealing of the listening devise is important, or during a tactical temporary operation requiring quick deployment like a hostage scenario.

Noise Reduction Systems

The ClearSound family of products offers users a unique, high-tech, leading edge solution to the problems of unwanted noise and interference on speech in communications and surveillance operations. ClearSound incorporates advanced signal processing algorithms, which are specifically designed for the removal of background noise from speech on a continuous and adaptive basis.

WREN WiFi
Store Forward Audio Transmitter

The WREN WiFi Store Forward Audio Transmitter is a new concept in audio surveillance, combining an audio recorder with an integrated WiFi interface that is used for recording and online listening.

Digital & Analogue
Audio Transmitters

The GEM NGDP-10 digital audio data packet transmitter is a fully commandable transmitter offering high levels of protection from interception. The NGDP-10 data packet transmitter is suitable for most concealments, making it an indispensable intelligence gathering tool for undercover operations.

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