

# iSPY Fiber Optic Intrusion Detection System



## Features

- Continuous monitoring of all optical fibers
- Local and remote management and alarming
- Accurate intrusion location
- Transparency to all speeds and protocols
- Modular system can be configured to meet network needs
- -48 VDC operation (100-250 VAC option available)
- Fits into FSXpert™ chassis (19"/23" EIA or WECO)
- Removable adapters for easy cleaning
- Connectors exit at an angle to prevent fiber bends



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iSPY Intrusion Detection

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## The Problem

Fiber optic networks are increasingly vulnerable to tapping and intrusion often for the purpose of corporate and government eavesdropping, espionage, disrupting networks, and potential terrorist activities. A simple clamp-on optical tap attached to a live fiber is all that is required for a successful tap. Once tapped, all voice and data communication is available to the intruder. Since network equipment cannot detect most types of optical taps, a means to detect, locate and notify the network operator of a tap is a necessary element for the security of any optical network.



## The Solution

As the leader in remote access, monitoring, switching and testing, Alcon Technologies effectively solves the problem of fiber optic tapping with its iSPY fiber optic intrusion detection

system. Using optical monitoring equipment, the iSPY system continuously monitors each fiber for intrusion and optical power degradation. When an intrusion takes place, the iSPY system quickly traces the fiber to pinpoint the location of the intrusion for further investigation. The system is non-intrusive, and can be used on dark or traffic-carrying fibers.



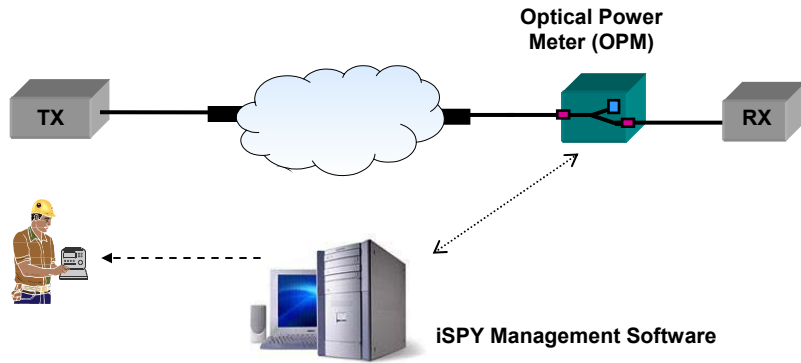
# iSPY Fiber Optic Intrusion Detection System

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## Intrusion Detection

Figure 1 illustrates intrusion detection with the iSPY system. The Optical Power Monitor (OPM) continuously measures optical power in the fiber. The OPM features a high optical resolution that allows detection of minute power changes. It also provides the user the ability to set up to four alarm thresholds. When intrusion or tapping into the fiber occurs, the Optical Power Monitor detects a threshold crossing, and it generates an alarm. This alarm is detected by the iSPY Management Software. A user is notified by a window pop up on the operations center computer screen, and by email or page alert.

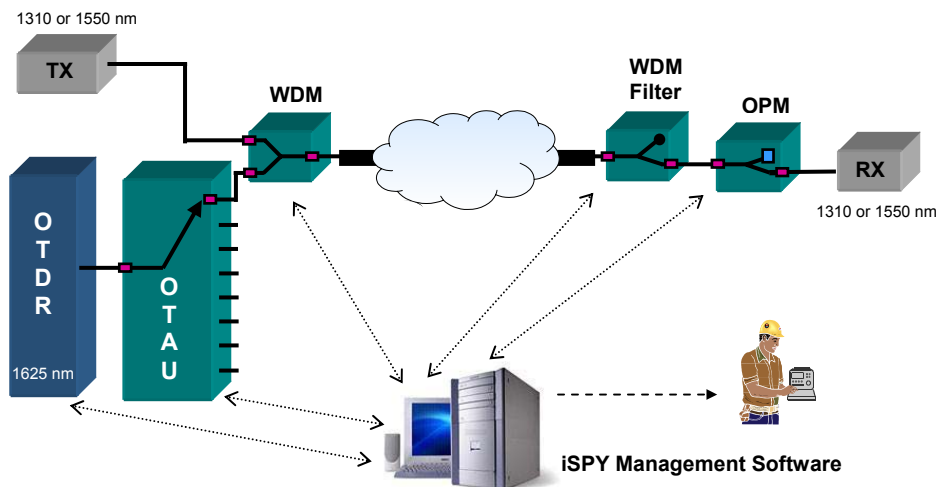
Figure 1 – Intrusion Detection



## Intrusion Location

Figure 2 illustrates intrusion location with the iSPY system. In addition to the detection capabilities of the OPM, the system incorporates an OTDR (Optical Time Domain Reflectometer) to locate the intrusion in the optical network. After an alarm is generated as illustrated above, the iSPY Management Software automatically positions the OTAU (Optical Test Access Unit) to the fiber in alarm. The OTDR then generates a trace to locate the intrusion point by comparing this new trace to the reference trace identifying the new attenuation point along the fiber (see figure 3). The WDM (Wave Division Multiplexer) multiplexes the 1625 nm out-of-band OTDR trace with the 1310 or 1550 nm network traffic. A WDM filter is used to allow uninterrupted transmission during the intrusion location process.

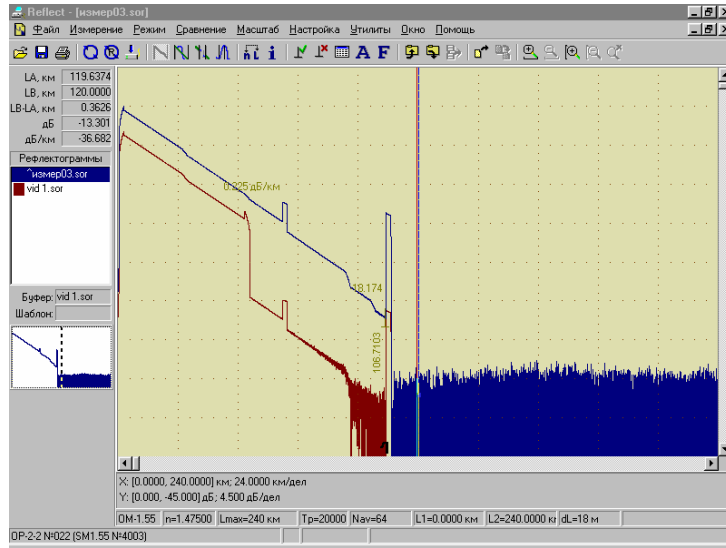
Figure 2 – Intrusion Location





# iSPY Fiber Optic Intrusion Detection System

Figure 3 – OTDR Trace Comparison

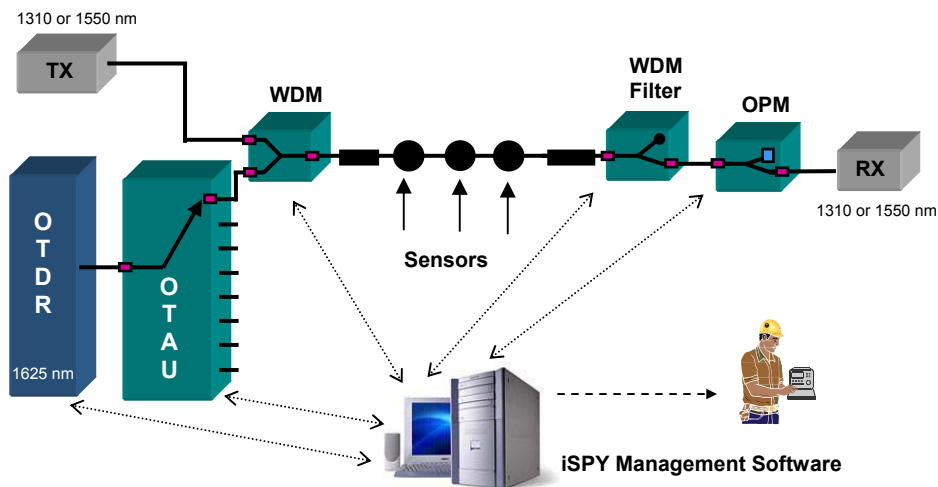


## Additional Security – Manholes and Cabinets

The iSPY fiber intrusion detection system can also be used to monitor access to manhole covers, cabinet doors, and other key security points. Figure 4 shows sensors being used to detect the lifting of a manhole cover or the opening of a door. When intrusion occurs, the sensor induces a small extra attenuation to the fiber. This loss is detected immediately by the OPM, which sends an alarm identifying the affected fiber to the management software. The OTDR then sends a trace to the fiber in alarm to locate the intrusion point. The software will identify each sensor switch that is activated if more than one intrusion takes place along the same fiber.

If multiple fibers are being affected at the same time, the system will test them in the order of intrusion. During an alarm, the system continues to monitor the fibers. This is accomplished by automatically resetting the optical power monitor thresholds to the new power level and by automatically resetting the reference OTDR trace.

Figure 4 – Intrusion Detection with Sensors





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## **System Components**

### Optical Power Monitor (OPM)

The optical power monitors play a critical role in the security system. This device continuously monitors the fiber, taking power level measurements every 250 msec. The optical power monitor is a dedicated device in the security system, assuring there is no delay in detecting intrusion. Its low 0.02 dB resolution allows detection of minor changes of power in the fiber.

### Optical Time Domain Reflectometer (OTDR)

The OTDR pinpoints the intrusion location in the fiber optic network. It uses a 1625 nm wavelength to allow uninterrupted traffic in the network.

### Optical Test Access Unit (OTAU)

The OTAU is a 1xN optical switch that enables use of the OTDR among multiple fibers in the network. This switch is available with 4 to 96 optical ports.

### Wave Division Multiplexer (WDM) and WDM Filter

The WDM multiplexes the out-of-band OTDR trace at 1625 nm with the network traffic at 1310 or 1550 nm. A WDM filter is used to allow uninterrupted transmission during the intrusion location process.

### Chassis and Controller

The Chassis and Controller provide power and communication to all modules. The chassis mounts in a 19" or 23" rack, and uses redundant -48 VDC power input. The controller has an Ethernet and a serial interface for external communications. Figure 5 shows an example of a 3U and 5U high (5.25 and 8.75 inches) chassis.



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