FFT Secure Link™

Installation Overview

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How it Works

Future Fibre Technologies' Microstrain/Locator technology employs singlemode optical fibres as its sensor, detecting minute movements, vibrations and sounds acting on the cable, and whatever it is attached to or buried with.

This Microstrain sensor is based on "Interferometry", and two of the fibres within the sensing cable form the arms of an interferometric sensor. Using a coherent laser, we send a continuous light (not pulsed) down both fibre arms of the system. If there has been no external motion, sound or vibrations acting on the fibres, the returning light on both arms of the interferometer will look the same to the optical detector, and the result will be zero.

If there has been an external interference on the fibre (motion, sound or vibrations) then the returned waveform will be changed and an interference pattern generated. The Sensing Controller will detect this change and the FOSS software will interpret the effect as either an intrusion event, or reject it as ambient conditions.

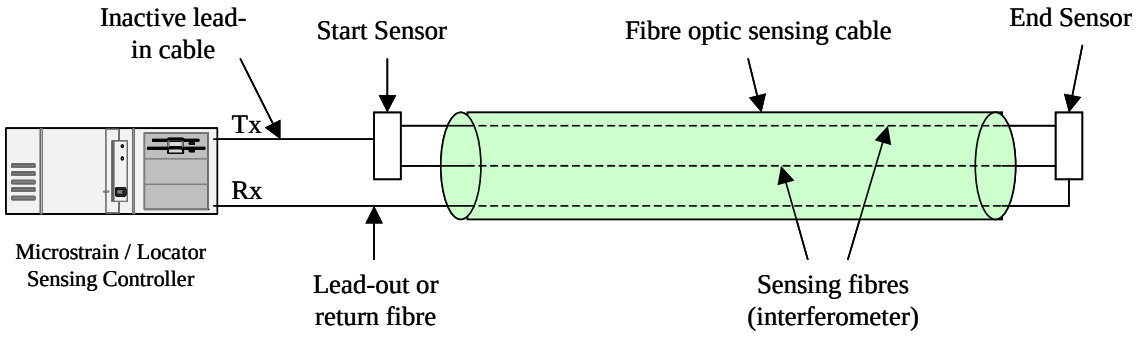

Fig 1: Secure Link System

The Sensing Controller identifies the event and can, through the FOSS software, determine the type of event. Using the unique recognition features in FOSS, we can minimise false alarms created by ambient noise and events while ensuring >95% detection of intrusion events.

FFT Secure Link™ provides an unlimited amount of zones using 3 optic fibres within the one cable, and is able to detect and locate multiple tampering or intrusions events in real time.

The Locator portion of the system will locate any intrusion attempt to within 25 meters (25 yards) on networks. This unique feature allows you to pinpoint the intrusion location on a network up to 80 kilometres (50 miles) long. It also reduces the number of systems required, since multiple fixed zones and the associated hardware are not required. It should be noted that the return or Lead-out fibre can follow a completely different path in a different cable – it does not need to follow the same path as the interferometer at all.

Power is not required along the sensor, nor is the sensing cable at risk of damage from electrical interference, lightning strikes, EMI, or RFI.

Sensing Distances

A major advantage of using FFT's Microstrain/Locator technology is the consistency of the detection response over network distances of up to 80 kilometres or 50 miles (total optical path length) – 40km or 25 miles in a straight line - without the need for any external hardware other than the fibre optic sensing cable itself. For longer distances, simply network additional Secure Link systems together.

Zoning

Via FFT's Central Alarm Monitoring System (CAMS), the system has the flexibility to be configured either as a large single zone sensor or as multiple smaller zones. These zone lengths are software configurable, so you can break down the one sensor cable into multiple zones of varying lengths to correspond with the positions of CCTV's, lights, service pits etc. CAMS interfaces to a Pelco P series and other manufacturers' switchers, IP based CCTV cameras, MODBUS control systems, and higher level security management systems via software.

If these zones are kept short and manageable, then it is much simpler to locate with greater accuracy where a breach has occurred.

Interference Immunity

One specific benefit of fibre optic based systems is their immunity to electromagnetic interference, particularly important for installations near high voltage electrical equipment, or in areas subject to lightning strikes, electromagnetic pulses, strong magnetic fields, or RFI.

Intrinsically safe

Another important aspect is that no power, external electronics, or control hardware is required in the field other than for the sensing controller located at the start of the sensor. There is no power applied to or near the sensing cable itself, and the start and end sensors are passive optical devices also requiring no power.

Interfacing

All Future Fibre Technologies systems have the flexibility to interface to a wide variety of local or remote security management systems so that it can integrate with supporting security technologies such as display systems, cameras, lights and audible alarms. Systems also interface to Email systems, contact modules, and various applications running under Windows or Linux via software development kits.

Secure Link

Secure Link™ utilises a fibre optic sensing cable that combines the characteristics of both a piezo-electric transducer and strain gauge sensor, with a very wide dynamic range. It is designed to detect disturbances generated by TPI activities and physical network intrusions, while discriminating between normal ambient conditions. It is suitable for use on WANs / LANs, Power Distribution, Communications, and SCADA networks to name a few.

The Secure Link system is very sensitive to minute cable movements and the frequencies of the sound or pressure waves generated by intrusions. Through the use of intelligent signal processing, these can be isolated from other environmental signals for clear identification, with minimal false alarm rates. Secure Link is already installed in numerous commercial, military and government applications.

Using a New Cable as the Sensor

As you can see in Fig 2, the system comprises an optical fibre cable laid in close proximity or strapped to the cable bundle and a Secure Link Sensing Controller. This controller contains the opto-electronics, data acquisition hardware and signal processing software, and is installed at one end of the network (section) to be monitored in an internal control room. The system can operate in a stand-alone mode, or FFT can supply a CAMS (Central Alarm Monitoring System) and integrate a number of these Secure Link systems into the one central monitoring unit.

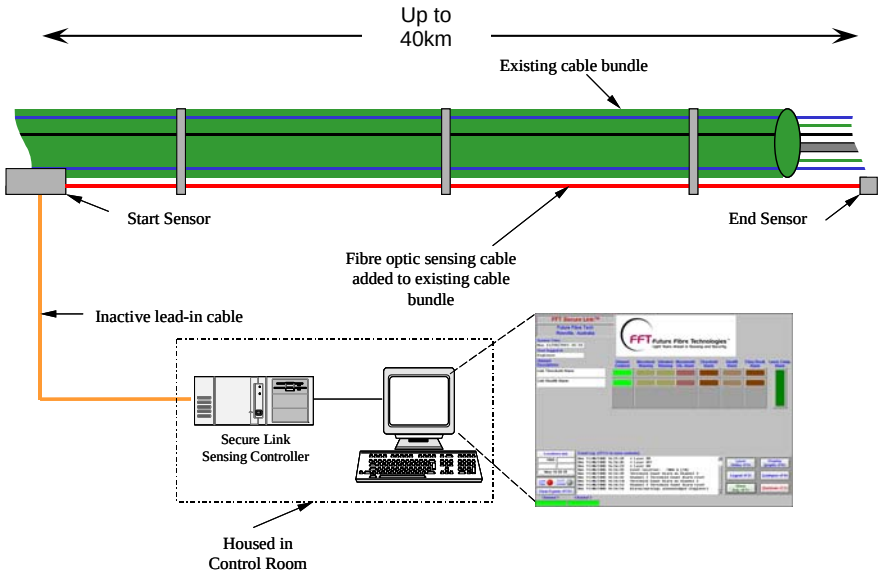

Fig 2: Basic Secure Link Layout

Utilising the Existing Cable as the Sensor

The most common and preferred method of installation requires 3 unused or "dark" singlemode fibres within the existing network cable/s, to be used as the Secure Link sensor.

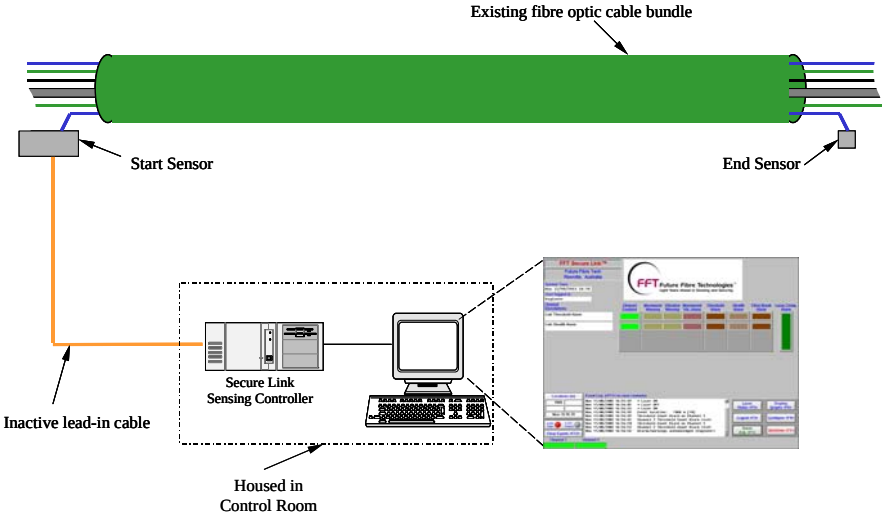

Fig 3: Secure Link Installation using existing fibre optic cable

In both of these installation examples (a separate sensor cable or utilising unused fibres in an existing cable), a non-sensitive feeder cable is installed between the Sensing Controller housed in a Control Room and the sensing cable on the network.

The Start and End Sensors are spliced onto the sensing cable. Sometimes they are fitted to the patch panels at each end rather than breaking out the cable. The actual method used depends on the individual installation.

Note: Preferably there will be no connections at all on the 3 dark fibres utilised as the sensor throughout the network, just fusion splices. However, if connectors are required, the **only** connectors permitted are SC/APC connectors supplied by FFT. System performance cannot be guaranteed if non FFT supplied connectors are used.

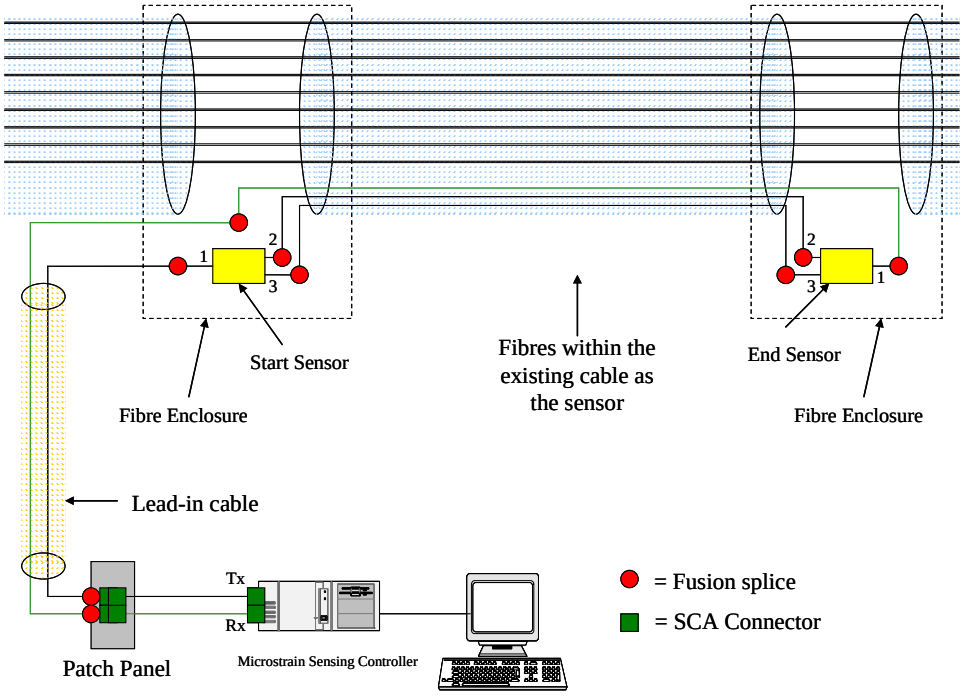

Fig 4: Secure Link Splicing Diagram

Cable Configuration and Installation versus Sensitivity

There are many variables in the installation of the Secure Link sensing cable, and these may have an impact on the sensitivity of the Secure Link system to external Third Party Interference (TPI). As such, each individual installation needs to be carefully assessed at the planning stage. Some of these variables include:

1. **The position of the sensing cable in relation to the network cable, and the desired area to be protected**

The sensing cable should be installed alongside the network cable bundle – preferably attached to it. If the sensing cable is too far from the network, you will not provide adequate coverage to detect all TPI events that may impact the network from both sides. If the sensing cable is not firmly and regularly attached to the bundle, you will miss deliberate tampering of the network cable if the sensing cable is left undisturbed.

2. **Conduits**

Location accuracy error will increase slightly if the cable is within PVC conduit, as it attenuates the signals. Steel conduit tends to reverberate along is length when struck with a lot less damping than PVC conduit provides, giving a much longer area of vibration and therefore a reduced location accuracy.

3. **Metal Armoured Cable**

Armoured fibre optic cable diminishes the external sensitivity of the Secure Link system. FFT does not recommend the use of armoured cable in any Secure Link installation required to detect nearby digging activities, but armoured cable will not affect the sensitivity of the system to detecting illegal data tapping or interference.

4. **Cable Path**

As Secure Link employs a distributed sensor, the path that the cable takes can have an affect on the sensitivity of the system. Try to avoid cable paths that are near large vibrating equipment such as motors, elevator shafts, air-conditioning plants, etc. Also avoid “doubling back” within the same cable as this may cause some averaging of locations. If you need to double back, please contact FFT for assistance.

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