

Functional Description

Omnitrax is a high-security, covert perimeter intrusion detection sensor system, that locates intruders with pinpoint accuracy. Omnitrax is based on ported (leaky) coaxial cable technology. A pair of sensor cables are buried around the perimeter of a site. The transmit (Tx) cable distributes radio-frequency (RF) signals along the cable path. The Receive (Rx) cable picks up the signals and carries them back to the processor. An invisible electromagnetic detection field is formed around the cables, and can detect the presence of an intruder within the field.

The Omnitrax processor includes the electronic circuits, which generate and monitor the detection field. The processor triggers an alarm when an intruder enters the field. Each processor can be powered individually and use contact closures to report alarm conditions, as a standalone unit. Alternately, multiple processors can be part of a network in which power and data passes along the sensor cables between the processors.

The Omnitrax processor supports two separate sensor cable sets, each up to 400 m (1,312 ft.) long. Each processor can accommodate up to 50 distinct sensor zones over the 800 m length of detecting cables. The alarm zones are defined in software and are not dependent on cable length. The Omnitrax processor can also collect and report alarm and tamper information from other security sensors, such as microwave sensors or fence detection systems.

Device Operation

Omnitrax generates the transmit RF spectrum inside a Field Programmable Gate Array (FPGA) device. The output codes are sent to a 12 Bit digital to analog converter. The output frequency is 32.125MHz with a 10.71MHz bandwidth. The output stage is a conventional RF chain consisting of an RF amplifier and a band pass filter. Channels TXA and TXB are functionally equivalent.

The Omnitrax receivers consist of band pass filtering, amplification, anti-alias filtering and digitization. The analog to digital converters are 14 bit devices, sampling at 128.500MSPS. Channels RXA and RXB are functionally equivalent.

The FPGA acquires the input samples and down-converts the RF spectrum digitally, there are no conventional mixers or IF stages. Once down-converted, the baseband response is passed to a delay based correlator bank. The correlators generate range bin responses for 40 range bins per receiver. Each range bin is approximately 12m, so the processor effectively “sees” out to 480m. The output sample rate of the correlators is only 20Hz.

Embedded in the FPGA fabric is a 32-Bit microprocessor equipped with a fully functional floating point unit. The correlator output, at 20Hz, is post processed by the

embedded MPU. Post processing consists of filtering out environmental responses, and computing and reporting the location and magnitude of targets.

In normal operation, the door of the Omnitrax enclosure is in the closed position. A door contact is monitored by the processor.

A microcontroller is included on the Omnitrax PCB to monitor the status of the cards power supply circuitry and peripheral features. The microcontroller also manages the circuit card's communication features.

Additional peripheral features of the card include relay contact outputs, auxiliary sensor inputs, integrated battery charger circuitry, integrated temperature sensor, and an integrated real time clock.

System Grounding

The Omnitrax enclosure includes a grounding lug connected at the base of the PCB mounting plate. A ground connection using #6 AWG or equivalent copper wire must be made between this point and earth. The Omnitrax enclosure derives its ground reference from this point. Refer to the Omnitrax Installation Guide for more specifics on the grounding interconnect.