

HazardAvert® Proximity Detection Systems

Hazardous situations can and do present themselves anytime miners or workers are operating around heavy machinery. And even though companies provide rigorous training to keep their employees safe, something simple such as a preoccupation with a job can cause unintentional harm. Proximity detection systems provide warnings to workers should they breach a protected zone, helping to keep them away from these potentially dangerous situations.

With the development of the HazardAvert® System, Frederick Mining Controls, LLC has positioned itself as an industry leader in Proximity Detection and Avoidance. Working in partnership with the Mine Safety and Health Administration (MSHA) to reduce crushing and pinning type fatal accidents, the HazardAvert® was the first Proximity Detection system approved by MSHA.

It has been successfully tested and in operation on various types of underground equipment such as continuous miners, as well as surface vehicles including haul trucks, fork lifts and drag lines.

Using a Magnetic Marker Field, HazardAvert® Systems alert miners and workers with audible and visual warnings, to danger areas as they work and navigate around heavy equipment and their inherent danger zones, and with selected systems, can automatically slow or stop the machines if miners are in a position of imminent threat.

At the heart of each system is our proven and reliable basic architecture, with the different models tailored to meet the demands that multiple vehicles and situations provide.

Our systems are broken down into four categories;

- Proximity Detection for Underground Coal
- Mine-Wide - Detection for all Mine Machinery, Vehicles and Personnel
- Proximity Detection for Hardrock Mining
- Proximity Detection for Surface Mining

HazardAvert® Features and Specifications for Underground Coal and Mine-Wide Systems:

Fail-safe

- Loss of power to Proximity Detection System stops machine
- Degraded communications from any generator stops machine
- Any generator cable cut or disconnected stops machine
- Degradation in the size of warning or stop zone stops machine
- Low Tracking Pad Lamp (TPL) battery stops machine

No False / Nuisance Alarms

- Zones can be sized and shaped to prevent unneeded alarms
- Active Closed Loop with multiple verification checks eliminates nuisance alarms

System Durability

- Generators, Controller and Displays are in X/P or F/P Enclosures
- Generators have rugged armor around the X/P enclosures
- Generators designed to withstand 10g shocks
- X/P enclosures use O-ring seals to seal out water
- Generator armor is also sealed with O-rings to provide dual level of protection from water (complies with requirements of SANS 10108)

No Calibration

- TPLs require no calibration - and no exposed antenna to damage
- Generators require no further calibration after initial installation

Indicators on Generators

- Power on indicator confirms good communication between generator and controller
- Indicates if Generator determines that a miner is in the Warning or Red Zone
- Indicates if Generator detects that a miner has activated a Remote Stop command

Low Frequency Marker Zones for High Stability

- Metallic objects within the field have little effect on zone size and shape
- Low frequency passes through the coal formation “looks around corners”
- Does not multi-path as occurs with higher frequencies

Stop Zone Automatically Stops Machine

- Any miner having a TPL can activate a Stop
- Tram and hydraulics will be disabled for stop condition
- The Stop Zone can be elongated to fit general shape of the machine
- Multiple stop configurations can be selected
- If multiple magnetic field generators are used, each will respond to a Stop signal
- Stop zone can be enlarged for machines traveling at higher speeds
- Size of Stop Zone and Warning Zone is adjustable
- Zone size can also be quickly adjusted within limits at each generator

Remote Stop Allows any Miner to Stop a Machine

- Pressing two of the three buttons on PAD in the TPL will stop machine
- Holding two specific buttons down on same TPL will cancel the Remote Stop

Tracking Pad Lamp (TPL) Gives Audible and Visual Warning to Miner

- A personal alarm device is built into the TPL
- Sounder positioned for positive hearing, LED within peripheral view
- Different warnings can be provided for miners entering different zones
- Many TPLs can be used in vicinity of machine without conflict
- Cable exits front or back of battery case

Warnings and System Status are Provided to Machine Operator

- Display reports status of field generators, communications, and warnings
- Display indicates miners in Warning and Stop Zones, warned of highest priorities
- Display indicates if a cable is cut or disconnected and reports failed or degraded generator
- Flexible Warning Outputs provided to drive auxiliary warning devices

Silent Zones Allow Miners to Operate Machinery

- Silent Zones disable proximity detection in selected locations
- Silent zones can be produced on work platforms such as used in full face or entry CMs
- May be placed anywhere management determines to be safe
- Multiple Silent Zones can be provided
- Once off of Machinery, operators are protected just like other “on-foot” workers

Multiple Zones Can Be Provided

- A Warning Zone is placed around the Stop / Danger Zone

- The Warning Zone can be used to slow machines
- A Monitor Zone is placed around the Warning Zone
- An I. D. Zone is placed around the Monitor Zone

Data Recording and Reporting Tools

- Events such as miners entering or leaving zones are recorded
- Tracks all miners in vicinity of machine
- Provides tracking of miner to the Tracking Display POD
- Data can be downloaded via Bluetooth® to a handheld device
- Future plans are to relay tracking data to mine communications system

TPL Checkout Station (COS) Available

- Upon exiting Lamp Room, each unit is automatically checked
- Allows each user to verify TPL is functioning and battery is charged
- Allows a central location for storing data to produce history reports
- POD memory and TPL COS can be combined

Shaft Clearance Available

- Entrance to mine by each miner can be recorded
- Exit from mine by each miner can be recorded
- Data can be used to confirm who is in and who is out of mine

HazardAvert® Features and Specifications for Surface and Hardrock Systems:

Like the Underground Coal and Mine-Wide systems, the Surface and Hardrock systems utilize a magnetic marker field that is detected by Personal Alarm Devices worn by miners or workers. Both audible and visual warnings are given to alert them when they enter danger or warning zones.

Two types of HazardAvert® systems are used on Hardrock machinery; *Integral* Modules and *Multi-Generator Systems*. While they operate similarly, with both featuring an easy to mount Proximity Module and compact, efficient PADs worn by workers, Multi-Gen systems offer more features and zone options. Zone sizes can be automatically adjusted according to speed and direction.

Integral Modules operate as independent units, and warn pedestrians and vehicle operators. Two Integral Modules can be combined on larger vehicles, each operating individually and providing total machine coverage.

Multi-Generator Systems utilize multiple Proximity Modules to allow electronically shaped zones, tracking and recording personnel and machines, plus the ability to shape warning and danger zones for specific equipment.

VADs (Vehicle Alarm Devices) are available with the Proximity Module, and will alert operators of the vehicles and machines that other vehicles may potentially collide.

Low Frequency Marker Zones for High Stability

- Metallic objects within the field have little effect on zone size and shape
- Does not multi-path as occurs with higher frequencies
- Reliable, helps eliminate nuisance alarms

No Nuisance Alarms

- Multiple Personnel and machines can operate in close proximity without

- conflicting signals or false alarms
- Workers are warned only when their safety is jeopardized
- Vehicle operators are warned when an “on-foot” worker’s safety is jeopardize

Silent Zones

- Automatic Silent Zones for the operator to function without alarms
- Once out of silent zones, operators are protected just as other “on-foot” workers
- Silent Zones give added efficiency without giving up warning detection to operators and other workers.

Shaped Fields - (Multi-Gen Systems)

- Elongated Zones to better match vehicle/machine shape
- Can be used in combination with dynamic zone sizing
- Dynamic zone sizing automatically re size zones based on speed
- Automatically shifts zone priority based on direction signals

Proximity Modules

- Contain electronics in a compact, weather tight housing
- Respond to Forward, Reverse, and/or Speed Signals to auto adjust Zone sizes.
- Proximity Module requires no further calibration after initial installation
- Modules are slaved to a central controller (Multi-Gen Systems)
- Tracking Display Pod with Tracking, Memory, and Bluetooth (Multi-Gen Systems)

PADs - Personal Alarm Device

- Attaches to hard hat
- Audio and visual alarms given when a danger zone is breached
- Sounders provide both audio and visual warnings - attaches to hard hat brim
- 2 Sounder models available with differing battery life between charges; 1400mAh / 500mAh
- PADs require no calibration during installation or operation

Multiple Installation Options

- Different Mounting options, including magnetic
- Warning zones can be adjusted within limits of Proximity Module
- Input voltage from the battery (VDC) can be 12 or 24 volts where 24 volts gives an increase in Maximum Warning Zone Size.

HazardAlert® Systems are also tough, reliable and easy to operate, promoting their use among workers.

If you have equipment that moves, HazardAvert® addresses the dangers involved to promote safety awareness, and to integrate seamlessly into your current safety strategies.