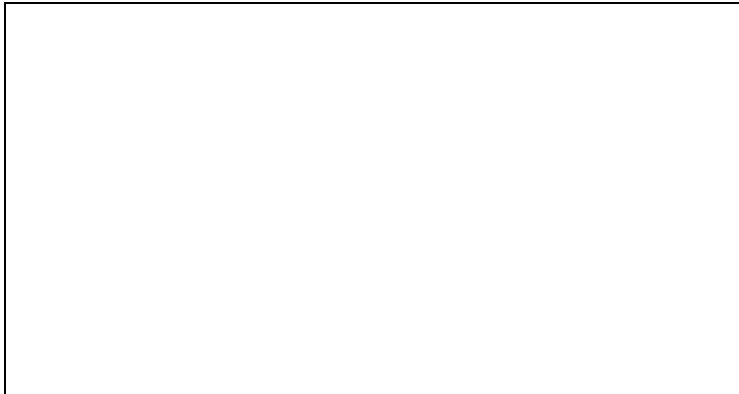


CONTAINER / TRUCK MONITORING SYSTEM
(For Radioactive contamination)
TYPE: TR1021 / TR1025 / TR1030

Technical Data



FEATURES :

- Uses 2/4 no.of 18000cc large volume plastic scintillation detectors.
- Uses Linux OS based SBC and FPGA Technology in the data acquisition unit.
- Ethernet port has been provided for connectivity to plant wide LAN / PC.
- Automatic / manual mode of vehicle scan supported.
- Offered in 2 detector configuration for heavy truck / container.

TRUCK MONITORING SYSTEM Type: TR1021/TR1025/TR130 manufactured by NUCLEONIX has been primarily designed to detect **clandestine** movement of radioactive and special nuclear material across the borders, sea ports, airports, nuclear and other high security installations in trucks and containers.

This system could also be used to detect radioactive contamination present in a moving vehicle loaded with steel scrap metal finished goods. Hence, this system finds use in steel industry, forging units and in large foundries to monitor incoming scrap and also to monitor outgoing finished products at entry and exit gates for radioactive contamination.

Truck Monitoring System is offered in 3 configurations for steel industry.

- (i) Heavy vehicle monitoring version - TR1021
- (ii) Container monitoring version - TR1025 / TR1030

The gamma detection system essentially comprises 2/4 large volume of plastic scintillation detectors housed inside each detector pillar. 2/4 numbers of PVT detectors each having a active volume of 18000cc are housed inside each detector pillar.

Each gamma detector is provided with necessary lead shielding to minimize the background and to enhance the MDA of the system.

The gamma assembly is housed inside a low Z material based detector pillar.

Two such detector pillars are placed along either side of the passage from where the vehicle is going to pass. This installed monitor automatically detects the presence of radioactive material being transported in vehicles if it exceeds preset levels. The monitoring system does this by measuring the radiation level taken while vehicle occupies detection area and comparing this level to the background radiation level that is measured and updated while detection area is unoccupied.

The background radiation levels are continuously measured and automatic adjustment of alarm thresholds enables a constant statistical false alarm rate to be maintained during the system use. Occupancy sensors are used to detect the presence or absence of vehicles as it passes through the monitor to know when to monitor the background and when to monitor the vehicle.

The sensitivity of detectors is dependent upon the closeness of the detector and source as well as the slowness with which they pass each other. For large trucks and vehicles, two detector pillars are recommended and maximum distance between pillar is 6m. Additionally barriers not obstructing the view of the monitor are to be installed to protect monitor from being damaged by vehicles.

The detector needs to be placed where speed of the vehicle is controlled and reduced. The speed of the vehicle should be less than 4Km.h-1 and the vehicle should not stop while passing through the monitor.

The performance and effectiveness of the installed instrument is strongly dependent on its ability to measure radiation intensity over the search area of interest. As such based on this requirement detector volumes, geometry and dimensions have been adopted.

Alarm indications and displays are available locally and are clearly visible to the officers manning the inspection point and are also available remotely at the central monitoring PC.

This system could be installed at various entry/exit points of the installation and can be under the supervision of security officer.

SPECIFICATIONS

(A) GAMMA DETECTION SECTION

Detectors Type: High sensitivity PVT detectors coupled to PMT detector

No. of detectors per pillar:

- 1. Detector / pillar for TR1021
- 2. Detector / pillar for TR1025 / TR1030

Volume of each detector : 18000cc

Dimensions of each detector: 1200 x 380 x 40mm

Energy range: 30 KeV to 5 MeV

Sensitivity of each detector: 400 CPS/ μ R/h (Approx)

Shielding : Suitable thickness lead shielding is provided on all sides of detector except the measuring face to suppress background radiation and to enhance MDA.

High voltage and front-end electronics: High voltage and front-end electronics are all housed together in each of the detector pillar.

(B) RADIATION DETECTION PILLAR :

- (i) Each radiation detection pillar comprising of 1/2 numbers of 18000cc large volume plastic scintillation detector along with lead shielding of suitable thickness form part of the gamma detection system (As described in section A)
- ii. No. of detector pillars persystem: 2
- iii. Distance seperation between detector pillars: 4 - 6m
- iv. Height of detector pillar: 3.6 mtrs.

(C) MEASUREMENT & ALARM UNIT:

This unit comprising of advanced electronic circuits with embedded code built-in to receive data from the gamma detector assembly and correct for background levels and generate audio/visual alarms in the event counts due to vehicle monitoring exceed the preset levels set.

Alarm data is automatically transferred at the end of monitoring to the central PC along with the photograph of the vehicle for further investigation by the duty personnel.

Background Updation: Automatic background measurement by sensing the detection area is unoccupied by using occupancy sensors.

Alarm Setting Adjustment: Automatically adjusted based on the current background level.

No. of monitoring channels: 2 for TR1021,
4 for TR1025 / TR1030

Display: 20 x 4 LCD display

User Interface: Front panel keypad (password protected) or through PC

Measurement Unit: CPS

Measurement Range: 0 to 99999 CPS

Alarm Range: 0 to 99999 CPS

Occupancy Sensing: Using IR/proximity sensors to detect vehicle presence.

Detection Area & Performance criteria:

Vertical : 0 to 3.6 mtrs.

Horizontal : 0 to 6m (Parallel to the direction of movement)

Speed of Vehicle : 0-8 Km/h

Audio/ Visual Alarms: Hooter and sounder have been provided for the purpose of generation of audio/visual alarms.

Vehicle Identification (optional): Images /Photographs of all the vehicles scanned for radioactivity are captured automatically by a camera and stored along with the corresponding readings.

PC connectivity : Ethernet port has been provided for PC connectivity.

(D) COMPUTER SOFTWARE & PC CONFIGURATION:

The data acquisition and control application software running on the host PC with a WINDOWS XP OS will communicate with the processing electronics through Ethernet port. This software facilitates remote configuration of paramters, live acquisition of data and analysis of profile for localization of any contamination.

The software is extremely flexible allowing the user to easily configure the system general operations like adjustment of detector parameters and accessing of database of all the individual vehicle scans. The software is so designed that it does not require the duty personnel to understand physics to operate the equipment.

PC Configuration : Standard PIV configuration with WINDOWS XP/2000 operating system (PC not within scope of supply).

System operating conditions :

Power supply : 230V AC \pm 10%

Temperature : 0 60o C

Humidity : upto 95% RH

En. Protection : IP54

Performance specifications & detection capability :

The truck monitoring system manufactured by Nucleonix will detect reliably very low levels of contamination which may be present in the vehicles carrying verity of scrap material. This system will reliably detect any contamination producing an exposure rate of 10mR/hr or 0.1mSv/hr a point source placed on the moving vehicle traveling at a speed of about 8 kmph. Detection capability will increase with decrease in speed.

Minimum Detectable Activity : MDA is computed @1 sec counting time from when the following sources are kept @ 1 meter distance from the middle of detector assembly.

Source	MDA
Cs-137	90 k Bq
Co-60	60 k Bq
Ba-133	90 k Bq

TRUCK / CONTAINER MONITORING SYSTEM



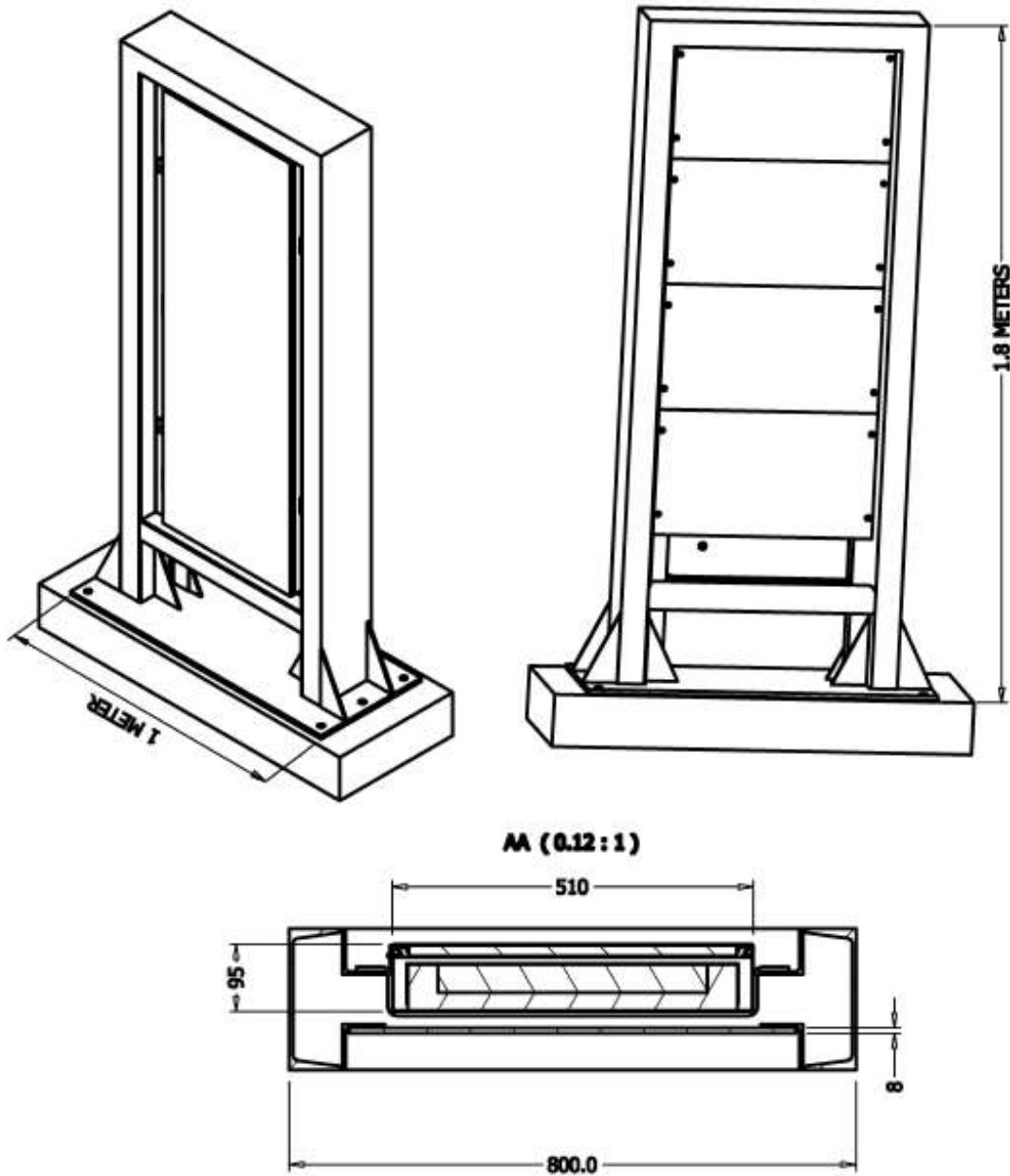
Data acquisition and alarm unit



Vehicle with scrap metal at the PVT detector pillars under inspection

OPTION - 1 :

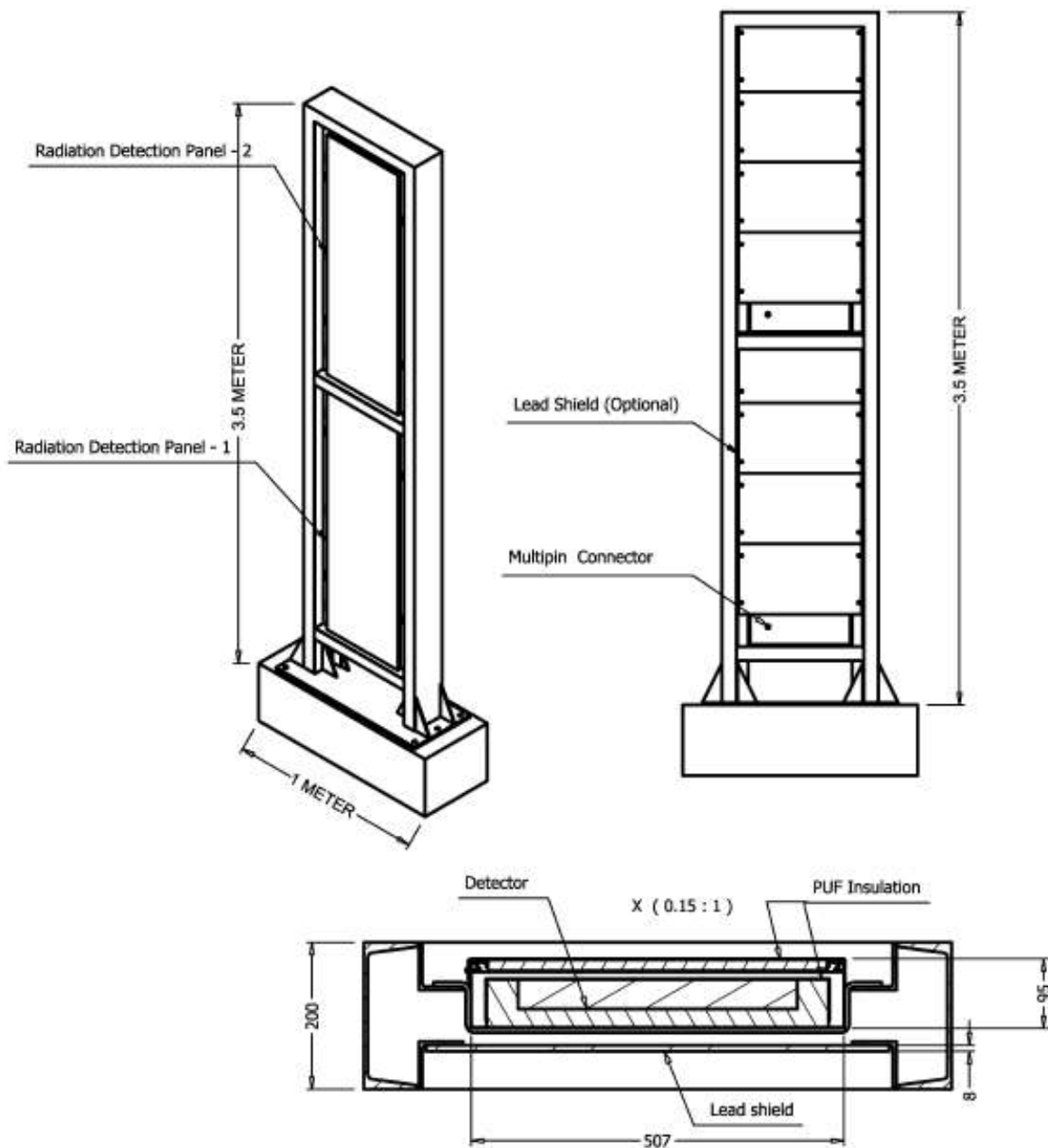
Truck monitoring detector system for medium / smaller trucks : This system comprises of TWO large volume PVT detector pillars with ONE detector module in each pillar.



Note : Two such detector pillars are installed on both sides of the path way for the trucks carrying scrap metal.

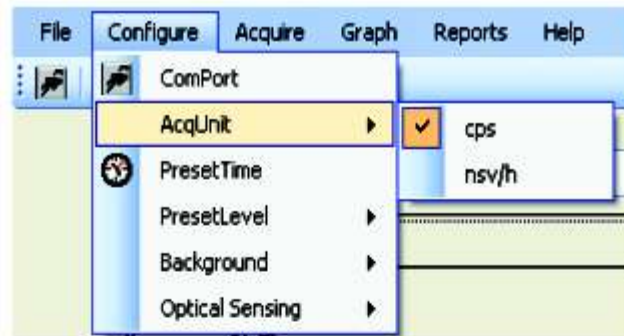
OPTION - 2 :

Truck monitoring detector system for medium / smaller trucks : This system comprises of TWO large volume PVT detector pillars with TWO detector module in each pillar.



Note : Two such detector pillars are installed on both sides of the path way for the trucks carrying scrap metal or container with scrap metal.

SOFTWARE SPECIFICATIONS



Software facilitates entry of truck parameters and report generation. Typical menu is shown below.

Truck Parameters

Date 09-17-2007 ▼

Time 10:36:07 ▼

TruckNo ▼

Truck Shape ▼

Driver Name

Truck Length

Truck Height

Truck Width

TruckWeight

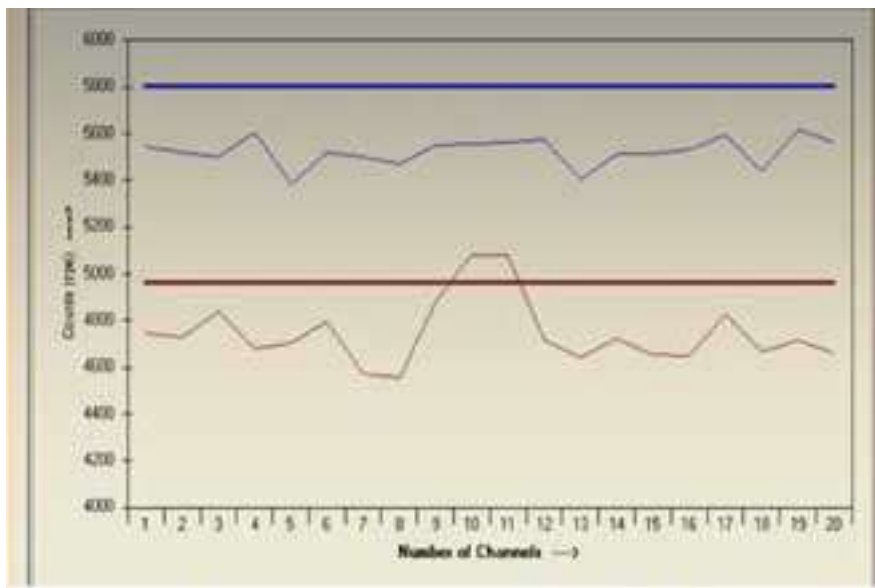
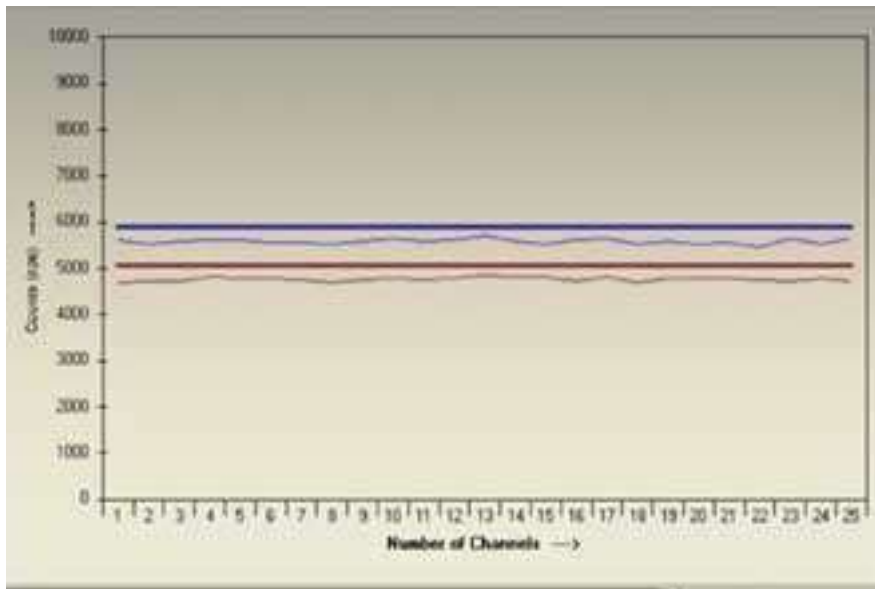
Scrap Weight

Gross Weight

Arrived From

Departed To

Activity profiles as shown on the PC monitor, indicating two detector channel output along with the preset alarm level shown in solid lines



Profile of Preset alarm level _____

Profile of Acquired Data (CPS) -----