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KritiScan® 6040 DV

Dual View X-ray Baggage Scanner



KritiScan® 6040 Dual View X-Ray Scanning System Solution Brief DV

Introduction

Advanced X-ray scanning systems have revolutionized security and inspection processes at high-security premises such as airports, government offices, railways, and other critical locations. These cutting-edge systems leverage innovative technology to generate highly detailed object views, incorporating best-in-class software with color, high-contrast filters, and advanced Image processing algorithms. Certified by AERB India for radiation safety, these systems offer atomic number-based material discrimination, distortion correction, dual-energy dual-view technology, and detection capabilities for explosives and narcotics. This solution brief highlights the salient features, differentiators, and available versions of these advanced X-ray scanning systems.

Versions

These advanced X-ray scanning systems are available in multiple versions to cater to different security and inspection needs:

- Single View: Provides a single view of the scanned object for basic screening.
- Dual View: Offers two views of the scanned object, improving the ability to detect concealed threats.
- 3-Dimension: Provides three-dimensional imaging capabilities, allowing for detailed inspections.

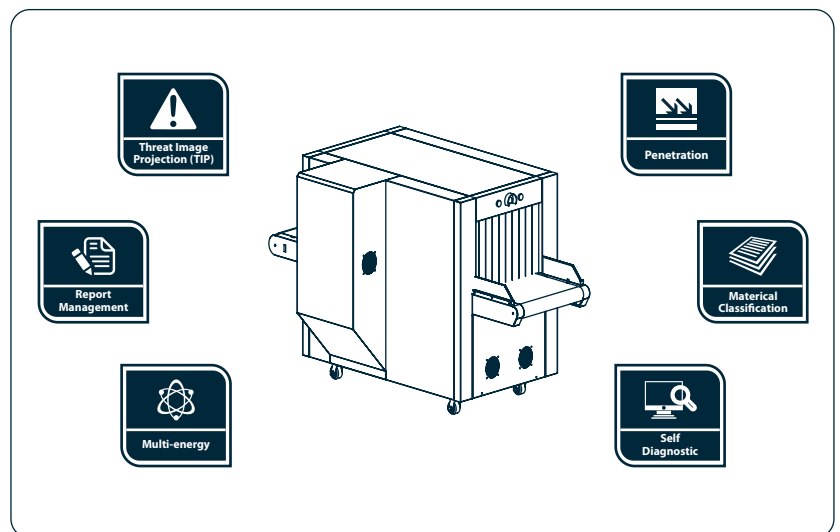


Figure 1 XBS



Figure 2 Console Table (NMS/LMS)

Architecture

For flawless installation and proper maintenance, the baggage scanners need to allocated space prior to the entry point of the premise.

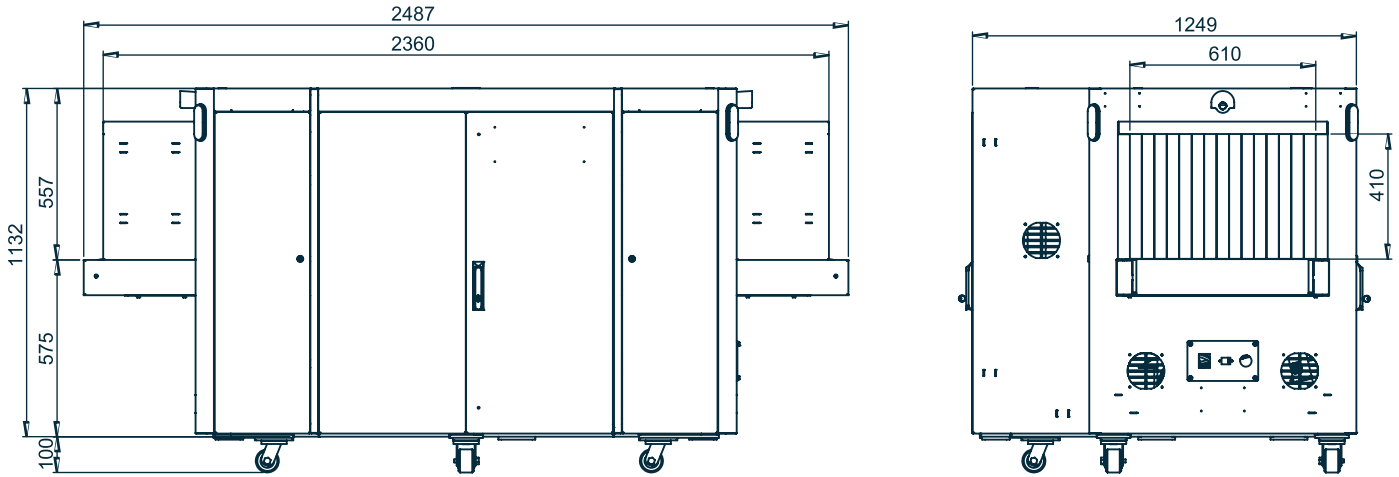


Figure 3 Dimensional Overview of KritiScan® 6040DV in Millimeter (mm)

Work Flow

When an object enters the tunnel, a sensor sends signals to an X-Ray Generator through an Electrical Board, prompting it to emit X-Rays. These X-Rays penetrate the object and the transmitted signal are sensed by the detector cards to generate the image.

The system has two X-Ray generators: a side view generator and a top view generator. The generators are triggered by the sensors that sense the bags. The detector cards are arranged in a manner to avoid blind spots and corner cuts. Pseudo-colored image is displayed following multiple image processing techniques of perspective correction, gain correction and others. Object detection and material discrimination are achieved through machine learning algorithms.

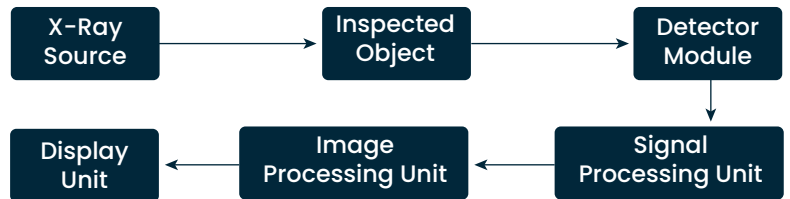


Figure 2.1 Working Diagram

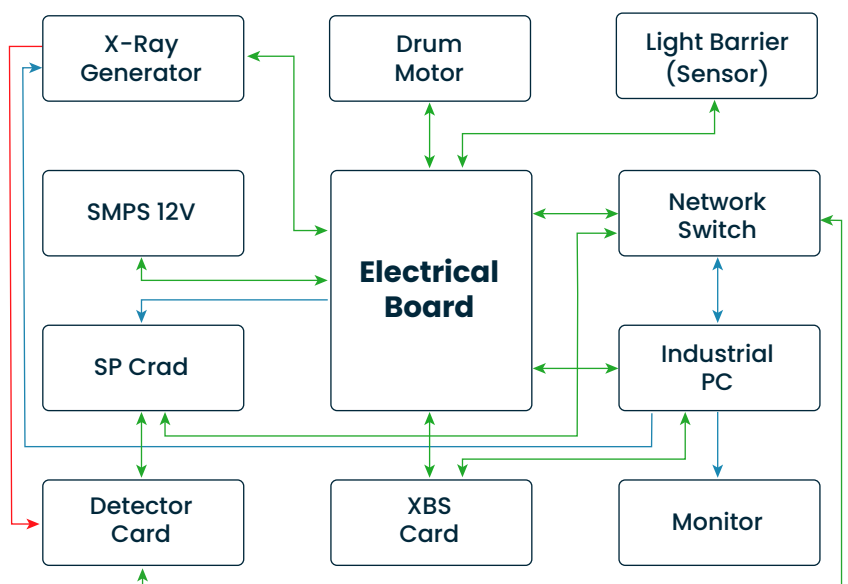


Figure 4 Working Diagram

Software System Architecture

KritiScan software, built on the C++ platform and compatible with Linux, follows a modular design approach to enhance system construction and expand functionality. Its user-friendly GUI simplifies operation. The software comprises three key components:

- **Data Acquisition Layer:** At the lowest level, this layer's primary role is to capture real-time data from the detector card.
- **Data Processing Layer:** This layer consists of three modules:
 - a. Data Pre-Process Module:** Responsible for preprocessing acquired data, including normalization, dead pixel correction and no image stitching preparing it for display and storage.
 - b. Data Storage Module:** Stores scanned baggage image data.
 - c. Data Analysis Module:** Uses high energy data through a pipeline of image processing and learning. Dangerous objects are identified.
- **Data Display Layer:** This layer showcases results from the data preprocessing layer, supporting various display modes like High penetration, Low penetration, Organic strip, Organic only, Negative, Black and white, and Edge Enhancement.

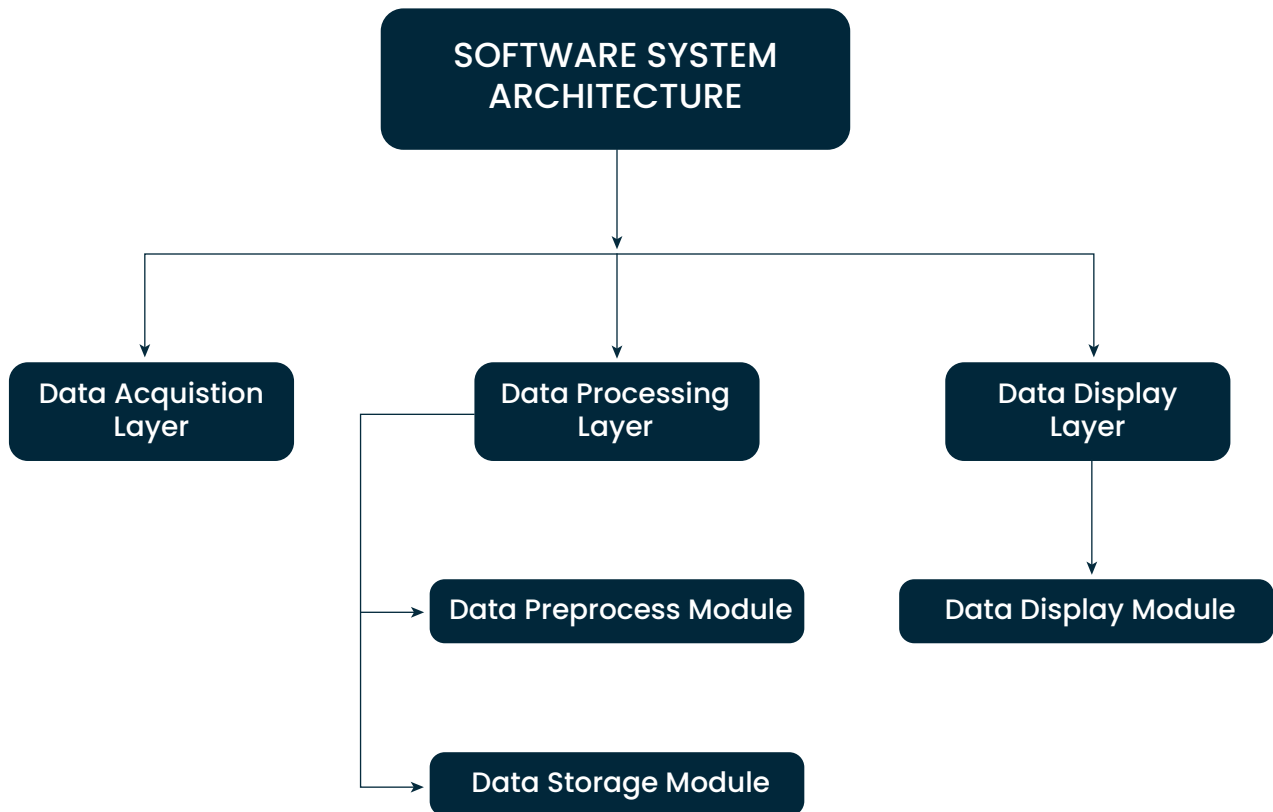


Figure 5 Software Processing Architectural Overview

Intel® Processors and technologies deliver power efficient performance and specialised capabilities. We are benefiting from SIMD MMX Instruction sets of Core i Series processor for further improving application performance.

Salient Features

1

Atomic Number-Based Material Discrimination

The X-ray scanning systems utilize atomic number-based analysis to discriminate between different materials accurately. This enables the identification of contraband items, hazardous materials, and potentially dangerous objects with precision.

2

Distortion Correction Through Software

Advanced distortion correction algorithms ensure that the images produced by the system are free from distortions or artifacts. This feature guarantees a high level of clarity in the images, allowing for more accurate inspections.

3

Dual Energy-Based Dual View Technology

Dual-energy X-ray scanning provides multiple views of the scanned objects, enhancing the ability to identify concealed threats, such as weapons, explosives, and illicit substances.

4

Explosives and Narcotics Detection

The system is equipped with state-of-the-art technology for the detection of explosives and narcotics. It employs advanced algorithms and materials analysis to flag potential threats accurately.

5

High Accuracy of Detection

These X-ray scanning systems offer an exceptionally high level of accuracy in detecting prohibited items, ensuring the safety and security of the premises being inspected.

6

High Penetration Feature

The systems provide high penetration capabilities, allowing them to effectively scan tightly packed objects, including baggage and cargo containers.

7

Lockable Console Table

A secure and lockable console table ensures that the system remains tamper-free and maintains the integrity of the inspection process.

Salient Features

8

Radiation Safety Certified by AERB

The X-ray scanning systems are rigorously tested and certified by the Atomic Energy Regulatory Board (AERB) in India, guaranteeing radiation safety compliance.

9

Self-Diagnosis

The systems feature self-diagnostic capabilities, enabling real-time monitoring and maintenance to ensure consistent and reliable performance.

10

Sophisticated Image Capture, Display, and Archival

These systems capture, display, and archive images with precision, allowing for in-depth analysis and record-keeping.



11

AI-Based Object/Shape Detection Software

Optional AI-based object and shape detection software further enhances the system's capabilities by automating threat detection and improving overall efficiency.

12

Threat Image Projection

Threat image projection is incorporated into the system, facilitating training and proficiency testing for security personnel.

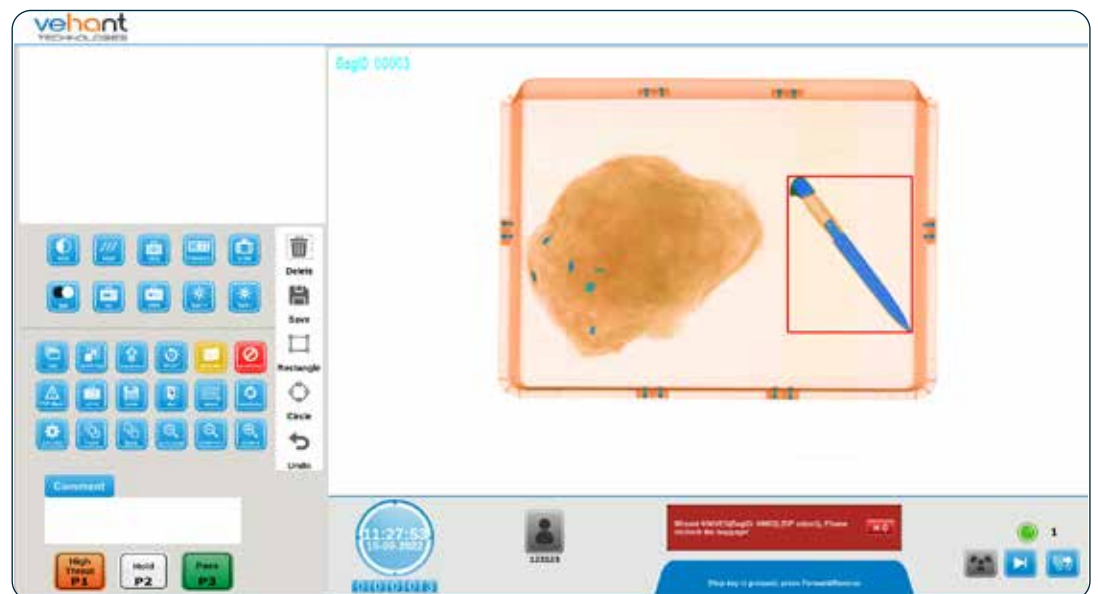


Figure 6 Threat Image Projection

TECHNOLOGY DIFFERENTIATOR

The differentiating factor of KritisScan 6040-DV lies in the integration of advanced AI - ML - Computer Vision algorithms. These algorithms are iteratively applied to the X-ray screening process.

- Improved Safety: AI and ML enhance safety by automatically identifying dangerous checked baggage and anomalies in real-time.
- Cost Efficiency: The systems optimize resource allocation and reduce the need for manual intervention, leading to cost savings.
- Efficiency: Unexpected incidents are identified through ML applied to anomaly detection and binary classification, increasing the efficiency of security operations.
- High Probability Threat Detection: Machine learning is leveraged to analyze X-ray data, enabling the algorithm to identify actual threats with a very high probability.
- Security and Accuracy: Image Processing Specifications offer superior threat identification capabilities, reduce false alarms, and increase operational efficiency, making it more reliable and effective for security applications.

Image Display Specifications

Specifications	Mode /Value
Color	Black/White
Penetration	High/Low
Enhancement	Super/Edge
Striping	Organic/Inorganic
Grey Level Scanning	Positive/Negative
Auxiliary Detection of Dangerous Objects	Positive/Negative

In conclusion, these advanced X-ray scanning systems offer a comprehensive solution for enhancing security and inspection processes at high-security premises. With their innovative technology, certification for radiation safety, and integration of AI and ML algorithms, they represent a significant advancement in the field of security screening.

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